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A MANUAL

OF THE

FLOWERING PLANTS OF CALIFORNIA

BY

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OUTLINE OF GEOGRAPHIC DISTRIBUTION OF SEED PLANTS IN CALIFORNIA

The flora of California is one of the distinctive floras in the region of Pacific North America. While continental floras are not sharply delimited, because there are no abrupt limits to climatic areas, it is possible, nevertheless, to determine, in a workable manner, the geographic bounds of the California flora or California province.

From the standpoint of plant provinces the term California must be defined in a sense different from that of its political boundaries. The natural biological province of California is primarily determined by its mountains and the Pacific Ocean. The two great mountain ranges, the Sierra Nevada on the east and the Coast Ranges on the west, enclose the bowl of the Great Valley—the plains of the Sacramento and San Joaquin. This main area is supplemented by two mountain masses, one (coastal Southern California) lying between the deserts and the ocean, an area very closely related botanically to the California area proper, the other mountain mass (the Klamath Mountains) lying at the northwesterly end of the bowl and equally related to the California area. There are, then, excluded the Colorado and Mohave deserts and desert slopes in the south, and also the interior plateaus, slopes and ranges belonging to the Great Basin and extending from Inyo County to Modoc County and thence to eastern Siskiyou County.

The northern boundary of the California province requires a particular description. In the western United States, there are only two rivers, aside from the Columbia River, which break through the main Sierra-Cascade axis and drain lands of the Great Basin, the Klamath River and the Sacramento-Pit River. There are thus three major physical breaks or barriers in the axis. As marking botanical boundaries, neither the Sacramento-Pit Gap nor the Klamath Gap is of as much significance in this connection as the Rogue River. Of the various physical features which distinguish the northern margins of the California province, the Rogue River is one of the greatest importance as defining by a mainly physiological barrier the botanical boundary of the California province northward. While the Klamath Gap marks the northern or southern extension of a number of species it is of secondary importance as compared with the Rogue River. There are a large number of species of Washington and Oregon which extend south to, or nearly to, the Rogue River, while a very large number of species of California extend north to, or nearly to, the Rogue River: the significance of these two categories is markedly greater than that of those widely-ranging species which cross the Rogue. A number of California species, to be sure, cross the Rogue but extend northward only a short distance. Similarly a number of Oregon species cross the Rogue but extend southward only a limited distance. The Rogue, in addition, therefore, as to such species, represents a mean of the physical conditions in a transition area.

The boundaries of the botanical province of California, in the largest sense, are, therefore, the Rogue River, the crests of the main Sierran axis, and the pass in the peninsular chain of mountains at or near the southern boundary of the state. The province thus consists of the bowl of the Great Valley, its great bounding chains east and west, and the contiguous coastal mountain masses, one at the south end, the other at the northerly or northwesterly end of the oblong bowl. This region is physiographically compact, and represents a very natural biological area; although it is at once obvious that there are marked intrusions from other floral provinces. A considerable element, arctic species, from the far north, enters the region along the summits of the high Sierras, as well as many boreal species from the Hudsonian and Canadian regions which are respectively subalpine and high montane in the Sierras. Important invasions from the floras of Washington and Oregon occur at middle altitudes in the mountains or in the coastal belt; while the flora at the lower altitudes, especially southward, shows in a marked degree the mingling of a large representation of species whose main center of distribution is in northern Mexico. It is, therefore, sometimes said that there is no such category

as a Californian flora, but, instead, a flora of the southwest United States and northern Mexico and a flora of the Northwest. To this argument the following rejoinders may be made: 1. The mass of endemic species in the California flora is large and of very marked character, as will be shown later in this outline. 2. The province is well characterized by a large number of species which have within the province their greatest development and extend little beyond it. 3. The species of the tongues of intrusion from neighboring floras have their highest development in botanical provinces to the north or to the south. 4. The thrusts from the north and the south lie at altitudinally different levels or occupy separate subclimatic areas, and do not intermingle or only to a limited degree.

The Life-Zones

As a result of the varying combinations of climatic factors in the area, intensified by distance from the ocean and by altitudes, the vegetation of California is markedly stratified into horizontal bands called life-zones. Six life-zones are here recognized, the terminology in their designation being that of C. H. Merriam (Life Zones and Crop Zones in the United States, 1-79—1898), namely, 1. Lower Sonoran. 2. Upper Sonoran. 3. Transition. 4. Canadian. 5. Hudsonian. 6. Boreal. The isothermal lines of a temperature chart of California correspond in a general way, though not exactly, with these life-zones, while a contour rain-chart shows similar correspondence. Annual rainfall, which is slight in the deserts of the Lower Sonoran, increases one-half inch for every one hundred feet in proceeding up the west slope of the Sierra Nevada. Insolation increases to the southward and increases markedly with altitude. Humidity is greatest along the coast and diminishes most sensibly toward the interior and in the south.

The response of species to the climatic factors varies greatly, and consequently they differ in their capacity for altitudinal distribution as well as in horizontal distribution. Certain general categories may be noted: 1. A few species occur in three or four zones, such as (a) aquatics or cosmopolites (Potamogeton pectinatus, Myriophyllum spicatum) or (b) species of wide range (Populus trichocarpa, Barbarea vulgaris, Radicula curvisiliqua, Trifolium involucratum, Hypericum anagalloides and Achillea millefolium var. lanulosa). 2. A large number of species occur in two zones (examples are Juncus bufonius, Brodiaea ixioides, Castanopsis sempervirens and Eremocarpus setigerus). 3. A large proportion of—in some cases half—the species of a zone occur only in that zone or are not well developed beyond its borders. Of these certain ones are selected as "Indicators" of the zone, or Index Species. The characteristics which determine an Index Species are: (a) restriction to the life-zone or, if it be abundant, weak transgression beyond its limits; (b) wide range in the zone; (c) abundance of individuals. It is now necessary to describe the climatic and vegetational features of the life-zones within the state of California and cite some important index-species, so far as may be done within the brief limits of this outline.

The Lower Sonoran Zone comprises three distinctive areas: (a) Colorado Desert or Colorado Sonoran, (b) the Mohave Desert or Mohave Sonoran, (c) the Great Valley or Valley Sonoran. The two deserts are characterized by a typical desert climate. They have a low humidity and a low rainfall, the annual precipitation varying from about 0 to 5 inches. They have high summer temperatures, averaging from 90° to 130°; they have low winter temperatures, varying from about 15° to 50°; and finally, as to temperature, they have a great annual temperature range and a great diurnal range. Drying winds of gale force are prevalent. The vegetation has the characteristic aspect or facies of plants of desert regions, that is, there is everywhere exhibited a marked development of structures to inhibit transpiration, or of physiological devices for the conservation of water. These various forms may be described, in general, under five headings: (a) Plants with condensed bodies such as the species of Cereus, Mammillaria, Echinocactus and Agave. (b) Plants with reduced or obsolete leaf surface, such as Cercidium torreyanum, Ephedra californica and Parosela spinosa. (c) Plants with fleshy leaves, such as Lycium andersonii. (d) Plants with resinous, woolly, or scurfy covering to

the whole body, such as Atriplex hymenelytra, Grayia spinosa and Tidestromia oblongifolia. (e) Ephemeral annuals whose life history from germination to seeding is accommodated to the short period (often only a few weeks) of late winter or vernal rains and of moderate temperatures. These annuals are represented by numerous species and often by vast numbers of individuals. Certain shrubs or small trees show a similar adaptation in that their leaves appear only during the rains (Fouquieria splendens).

The Colorado Desert lies at a low altitude, mainly between 0 and 500 feet. Characteristic species of chenopods are Atriplex hymenelytra, lentiformis, polycarpa and canescens. Achyronychia cooperi is prostrate on the desert sands. Parosela emoryi and schottii are low bushes. Other common species are Astragalus sabulonum, Euphorbia eriantha, Thamnosma montana, Petalonyx thurberi, Langloisia setosissima, Chilopsis linearis, Orobanche cooperi, Filago depressa, Encelia farinosa, Palafoxia linearis and Baileya pauciradiata. Only a few species of trees occur, such as Olneya tesota, Prosopis juliflora var. glandulosa and Prosopis pubescens, all the arborescent species being limited to stream beds and the borders of springs or low-lying valleys. This desert passes gradually into the Mohave Desert; the most practicable line of separation extends from Morongo Pass easterly to Riverside Mt. on the Colorado River. The low-lying Palo Verde Valley thus falls within the Colorado Desert.

The Mohave Desert lies at a higher level than the Colorado Desert, the altitudes ranging from about 2000 to 5000 ft., and the rainfall is usually somewhat greater. In other respects it has a desert climate similar to that of the Colorado Desert, and its vegetation presents a similar desert facies. Hundreds of square miles exhibit the dark green of Larrea tridentata var. glutinosa, a shrub commonly 3 to 6 feet high with very small resin-covered evergreen leaves, the individuals widely but rather regularly spaced in response to the meagreness of soil-water. Low shrubs or bushes of gray hue are abundant, and include such widely distributed species of the desert valleys as Atriplex confertiflora, parryi, hymenelytra, lentiformis, torreyi, polycarpa and canescens, Franseria dumosa and Encelia farinosa. Chrysothamnus nauseosus and Acamptopappus sphaerocephalus are abundant and widely distributed on the mesas, while Lepidium fremontii is a frequent low bush. Salazaria mexicana, Lycium andersonii and cooperi are roughish or spiny shrubs. Suaeda suffrutescens is characteristic of alkaline valleys, while Thamnosma montana is a small switch plant of the arid slopes. Characteristic desert herbs are Hesperocallis undulata, Calochortus kennedyi, Chorizanthe rigida, Chorizanthe thurberi, Eriogonum trichopodum, inflatum, baileyi and mohavense, Achyronychia cooperi, Dithyrea californica, Lesquerella palmeri, Lepidium flavum, Astragalus layneae, tricarinatus and dispermus, Petalonyx thurberi, Phacelia minor, Orobanche cooperi, Monoptilon bellidiforme, Aster carnosus, Hymenoclea salsola and Palafoxia linearis. Extensive groves of Yucca brevifolia, the individuals 16 to 30 ft. high, lend an added touch of strangeness to the xerophytic populations. Save for this one species, true trees are mainly absent except that along stream courses, about springs or in low valleys where roots may go down 20 to 70 feet to a low-lying water stratum, a few species occur, such as Prosopis juliflora var. glandulosa and Prosopis pubescens.

The Valley Sonoran comprises the plain of the Great Valley of California except the lower or central delta portion. It is a grass land formation, varying in altitude from 10 to 500 feet, with less extremes of temperature than the desert areas and a greater rainfall. In its primitive condition it is characterized by vast numbers of annuals which germinate with the winter rains and flower during the vernal period, such as Trifolium tridentatum, Gilia tricolor, Phacelia tanacetifolia, Allocarya stipitata, Orthocarpus erianthus, purpurascens and densiflorus, Mimetanthe pilosa, Layia platyglossa and Achyrachaena mollis; while very characteristic perennial herbs are Eschscholtzia californica and Grindelia camporum. Large areas of alkaline flats are encountered, especially on the west side of the valley. These have a characteristic vegetation such as Distichlis spicata, Anemopsis californica, Nitrophila occidentalis, Allenrolfea occidentalis, Atriplex cordulata, bracteosa and expansa, Spergularia macrotheca, Lepidium latipes, Astragalus tener, Trifo-

lium fucatum, Sida hederacea, Frankenia grandifolia and Cressa cretica. On the valley floors or undulating plains the traveler finds small depressions a few yards square and a few inches deep which fill with water in the rainy season. When a little deeper, well-defined and numerous, they take the name of "hog wallows." With the coming on of the dry season the water evaporates and the beds of these pools in late spring or early summer give rise to a distinctive flora composed of such species as Lepidium latipes, Boisduvalia cleistogama and B. glabella var. campestris, Lythrum hyssopifolia, Navarretia leucocephala, Downingia elegans and pulchella, Mimulus tricolor, Psilocarphus brevissimus and Evax caulescens. The narrow curtain of trees along the streams is composed of Platanus racemosa, Populus fremonti, Salix nigra var. vallicola, laevigata and lasiandra—though the willows are not confined to the valley floors.

The Upper Sonoran Zone may often, in certain districts, be divided into two subareas, the lower foothill belt and the chaparral belt. The lower foothill belt is a grass-land formation, sometimes with a scattered growth of Quercus douglasii and Q. engelmannii. Its characteristic herbs are Odontostomum hartwegii, Chlorogalum angustifolium, Allium serratum, Collomia heterophylla, Trichostema lanceolatum and Plantago erecta. Next above the lower foothill belt is the chaparral belt, or *hard chaparral*, a very remarkable formation, so called by the writer to distinguish it from the soft chaparral. It has an average altitude of 1000 to 4000 feet and is characterized by the presence of extensive brush lands consisting of shrubs, some of which have been reduced in size from tree species (Jepson, Silva of California, 39). Most of the species represent extreme arid-land types and possess various markedly xerophytic structures, such as small or reduced leaves, entire leaves, thickened epidermis, hard and very dense wood, vertically placed leaves, small flowers, and seeds adapted to xerophytic conditions. The most widely spread and characteristic species are Ceanothus cuneatus, divaricatus and sorediatus, Arctostaphylos glauca, glandulosa, viscida and canescens, and Cercocarpus betuloides. One of the most extreme of chaparral types in xerophytic character is Pickeringia montana. Other species associated with the chaparral species but exhibiting less extremes of xerophytic structure, are Dendromecon rigida, Photinia arbutifolia, Rhamnus californica, Rhus diversiloba, Fremontia californica and Eriodictyon californicum. Many of the species of true chaparral grow to large size, simulate trees in shape and hence form what is called a pigmy forest. For the most part they inhabit rocky or gravelly slopes or ridges and grow on well-drained slopes. True or hard chaparral is always a mixed formation. Chamisal, characteristic of the same sub-life zone, is commonly a pure formation of Adenostoma fasciculatum.

Chaparral is, for the most part, a firetype formation and shows evidences of long-continued fire-ravage. In all likelihood the factor of fire has contributed to the xerophytic character of the chaparral, because fire has, without doubt, run through the chaparral belt for many thousands of years, very likely one hundred thousand years at least. Of all the genera in the chaparral the genus Arctostaphylos has the largest number of species represented in the formation and shows the most marked responses and most evident adaptations to age-old fire conditions. The responses are of two main kinds and I have named them as follows: 1. Empyroism (Empyrophytes). Under which the individual continues to live. Some species, such as Arctostaphylos glandulosa, develop the root-crown horizontally in the form of woody platforms at and just below the surface of the ground after fire, and from these woody platforms crown-sprouts arise for the replacement of the shrub crown. As fires run year after year, or decade after decade, the woody platform continues to increase in diameter horizontally, and often become 3 to 5 feet broad. Other species, such as Adenostoma fasciculatum, form bulbous or carrot-like root-crowns which continue to enlarge under successive fires. 2. Pyrodaptism (Daptophytes). Under which the individual dies. Certain species, such as Arctostaphylos sensitiva, are shallow-rooting and are killed outright by chaparral fires. They have not the capacity to develop root-crowns horizontally or bulbous-wise. They must depend for regeneration of the species wholly upon seeds. Seeds are produced in great abundance, germi-

nate freely after fire and promptly establish seedlings on a burn. Such seedlings have the power to come into the reproductive stage in a short period—sometimes in five or six years. This is a clear adaptation of the species to reproduce in a span of years fewer than the years of fire interval. This species and Arctostaphylos manzanita, stanfordiana, viscida and mariposa are true fire-type shrubs.

A list of some characteristic herbaceous index species of the Upper Sonoran Zone would comprise Carex tumulicola, bolanderi and barbarae, Juncus balticus and effusus, Chlorogalum pomeridianum, Allium hyalinum, Brodiaea laxa, Chenopodium californicum, Clematis ligusticifolia and lasiantha, Sedum spathulifolium, Trifolium variegatum, Hypericum concinnum, Helianthemum scoparium, Viola douglasii, Datisca glomerata, Sanicula bipinnatifida, Emmenanthe penduliflora, Salvia columbariae, Lotus scoparius, Micropus californicus, Psilocarphus tenellus, Hemizonia virgata, Layia glandulosa, Baeria chrysostoma, Monolopia major, Helenium puberulum and the shrubs Artemisia californica and Baccharis pilularis.

Coastal Southern California lies, below about 4000 or 5000 feet, mostly in the Upper Sonoran Life-Zone. It has many Upper Sonoran species peculiar to the area or extending into Lower California. Some of the more important are: Calochortus concolor and plummerae, Quercus engelmannii, Oxytheca trilobata, Clematis pauciflora, Romneya coulteri, Streptanthus campestris, Rhus laurina and integrifolia, Ceanothus macrocarpus and spinosus, and Mimulus brevipes.

The Transition Life-Zone is well defined, especially on its lower borders. The Sierra Transition lies between average altitudes of 2000 and 5000 feet, has a mean temperature of 55° to 60° and an average rainfall of 25 to 35 inches. It includes the main forest belt, and is repeated in the mountains of Southern California and in the Coast Ranges, where these latter rise to sufficiently high altitudes. This life-zone is distinctive and on the whole rather definitely circumscribed. It contains, for California, a greater number of species of trees and shrubs than any other life-zone and has, in addition, a very large population of herbs.

Widely developed in some parts of the state and very narrow in others, the Arid Transition of the Great Basin underlies the lower margin of the main Humid and Sierra Transition. It is, in California, a drier and more exposed subarea, often with a preponderance of brush slopes and scattered trees. Its most characteristic species are Pinus ponderosa, Artemisia tridentata, Arctostaphylos patula, Garrya fremontii and Prunus subcordata.

The Sierra Transition has a high development and forms a broad band. It carries the less open part of the forest belt. The dominant forest species are Pinus ponderosa and lambertiana, Libocedrus decurrens and Abies concolor. Sequoia gigantea is a marked feature of this zone in the southern part of the Sierra Nevada. The dry or more open forest or forestless slopes present many shrubs of wide range such as Corylus rostrata var. californica, Ribes roezlii, Rubus parviflorus, Amelanchier alnifolia, Rhamnus rubra, Ceanothus integerrimus, velutinus and prostratus, Cornus nuttallii, Rhododendron occidentale and Arctostaphylos patula. On the dry flats or open forest slopes typical herbs are Sporobolus confusus, Stipa elmeri, Allium campanulatum, Fritillaria parviflora, Habenaria unalaschensis, Corallorrhiza maculata, Asarum hartwegii, Silene lemmonii, Lathyrus graminifolius, Gayophytum diffusum, Pterospora andromedea, Pirola picta, Apocynum androsaemifolium var. pumilum, Gilia aggregata, Draperia systyla and Aster integrifolius. In the wet meadows or in swamps grow such species as Agrostis oregonensis, Veratrum californicum, Polygonum bistortoides, Ranunculus orthorhynchus, Heracleum lanatum, and Vaccinium occidentale.

The Redwood Transition, which comprises the coastal Redwood belt, extends from sea-level to 2000 or sometimes to 3000 feet altitude. It has, therefore, a very much lower altitude than the Sierra Transition. From the standpoint of precipitation, it is at a somewhat higher physiological level, because it has a greater rainfall, varying from 25 to 122 inches. From the standpoint of temperature it enjoys a lower annual range and lower diurnal range. Being wholly within the coastal fog belt and lying next the ocean, it has much

greater humidity. Proceeding from the Great Valley to the coastal edge of the Redwood belt, one passes through formations similar, in an ecological view, to those met with in ascending the Sierras from the Great Valley, since there are met successively the dry barren plains, the barren foothills, the chaparral and finally a narrow band of Pinus ponderosa and Quercus kelloggii, which is Arid Transition. In its greatest development the Redwood forms pure stands. In other parts of the belt it is dominant but with it is associated Lithocarpus densiflora, Pseudotsuga taxifolia, Tsuga heterophylla, Picea sitchensis and Abies grandis. On the inner side of the Redwood belt is a marked band of Arbutus menziesii, Pseudotsuga taxifolia and Quercus garryana. The forest floor of the Redwood belt is characterized by certain herbs which, often shade-loving, occur in great abundance and are, in California, restricted to the belt, such as Torresia macrophylla, Scoliopus bigelovii, Clintonia andrewsiana, Maianthemum bifolium var. kamtschaticum, Trillium ovatum, Asarum caudatum, Vancouveria parviflora, Achlys triphylla, Saxifraga mertensiana, Oxalis oregana, Viola sarmentosa and ocellata, and Mimulus dentatus. Certain shrubs form a very low understory and often occur in heavy stands, as Ceanothus thrysiflorus, Vaccinium ovatum and Gaultheria shallon. What I have called *soft chaparral* refers to a shrub formation of the Transition Zone. It is composed of such species as Physocarpus capitatus, Holodiscus discolor, Rubus parviflorus, Vaccinium ovatum and Symphoricarpos albus. Soft chaparral occurs in the Coast Range Transition, the Redwood Transition, the Sierra Transition and frequently as islands in the Upper Sonoran.

The Canadian Life-Zone is not well defined in the Sierra Nevada and has, as a separate zone, only a shadowy or wavering existence. Its natural place is on the average between 5000 and 7000 feet, where there is a mean annual temperature of 50° to 55°, and an average rainfall of 40 to 50 inches. The most useful index species in this life-zone are Abies magnifica, Pinus ponderosa var. jeffreyi, Pinus monticola and Pinus contorta var. murrayana. The first three species are, however, often found in the upper part of the Transition Zone, associated with typical Transition species, while the fourth is frequently a characteristic species of the next life-zone above, the Hudsonian. The following herbs and shrubs may be considered as belonging to this zone: Prunus emarginata, Arctostaphylos nevadensis, Nama lobbii, Hesperochiron californicus, Mimulus lewisii and Pedicularis semibarbata.

The Hudsonian Life-Zone is the timber-line zone, and is fairly well defined as to its upper borders. It has an average altitude of 7000 to 9000 feet, a mean annual temperature of 45° to 50°, and an average rainfall of 50 to 55 inches. The most important index species are Pinus albicaulis, Juniperus occidentalis, Juncus drummondii and parryi, Calochortus leichtlinii, Salix lemmonii and geyeriana var. argentea, Polygonum shastense, davisiae and imbricatum, Eriogonum pyrolaefolium, Ribes cereum, viscosissimum and montigenum, Epilobium latifolium and obcordatum, Kalmia polifolia var. microphylla, Cassiope mertensiana, Polemonium confertum var. eximium, Castilleia culbertsonii, Orthocarpus pilosus, Pedicularis attollens and groenlandica.

The Boreal Life-Zone is true alpine. Its altitudinal range varies from 9000 to 14,500 feet, with a mean annual temperature of 40° to 45° and an average rainfall of 60 to 70 inches. The most important index species are Trisetum spicatum, Carex breweri and nigricans, Oxyria digyna (which extends north to the aretic circle), Silene watsonii, Ranunculus eschscholtzii (which extends north to the aretic circle), Aquilegia pubescens, Dicentra uniflora, Parrya eurycarpa, Saxifraga tolmiei and bryophora, Potentilla procumbens, fruticosa, gordonii and muirii, Epilobium anagallidifolium, Primula suffrutescens, Erigeron compositus and radicatus, Hulsea algida and Senecio muirii. Draba lemmonii, breweri and glacialis, and Eriogonum ovalifolium are typical cushion plants. The Boreal Zone presents marked plant formations on the Salmon Mountains, Mt. Shasta, Lassen Peak and the high Sierra Nevada. It recurs evidently, though represented by few species, on Mt. San Gorgonio in the San Bernardino Mountains and feebly on Mt. San Jacinto in the San Jacinto Mountains.

Irregularities in the Life-Zones

The temperatures given above are of the Fahrenheit scale. While they are mean annual temperatures, and do not, therefore, represent the critical temperatures for plant life or plant growth, they do give an idea of the climate of the various life zones from the standpoint of temperature. However, these life-zones must not be thought of as marked by rigid horizontal lines or even by regular contour lines. The local boundaries of the zones are irregular or jagged for the following reasons:

1. *Insolation* increases markedly on proceeding southward, and normal temperatures increase correspondingly, so that, for example, the timber line on Mt. Shasta is at about 7500 feet, while on Mt. Whitney, 400 miles southeasterly, it is at 11,000 feet. In addition, normal temperatures fall with increase in altitude about 1° for each rise of 330 feet (S. S. Visher, Climatic Laws, 20). That is, all the zones gradually increase in altitude southward.

2. *Exposure* is related to local changes in the zones. The southerly or westerly slopes of a mountain receive a greater amount of direct heat from the sun, and a forest belt or a plant formation will run much higher on such a slope. The easterly or north slopes are much cooler, since partially protected from the direct rays of the sun, and a forest or a characteristic vegetational belt will run much lower on such slopes than the average boundary of the life-zone in that region.

3. *Steepness* of slope affects the regularity of the zone since it causes marked local changes in drainage, temperature and insolation.

4. *Accumulating blocks of hot air* at lower levels may cause local variations in the boundaries of the life-zone above, since hot air rises along definite slopes or air-lanes, avoiding others on account of topography.

5. *The flow of cold water and cold air* down a cañon will cause plants of a zone to extend to lower levels in that locality.

6. *Physiological Islands.* By reason of local topography and moisture and temperature conditions, a small area may be isolated from its proper life-zone and yet carry characteristic index species of that zone. Such areas are called "islands." They are surrounded by physiological barriers which sometimes delimit them sharply, almost as sharply as an oceanic island surrounded by the physical barrier of salt water. A well-marked Canadian Life-Zone island, carrying Pinus contorta var. murrayana, occurs in the lower part of Yosemite Valley (Transition Zone) under the shadows of the great cliffs about Bridal Veil Fall and the rock of El Capitan. A large island of the Lower Sonoran occurs in coastal Southern California between the Santa Ana and San Jacinto mountains, while a long but narrow island of the same zone occurs in the upper part of the Salinas Valley and Carissa Plain. These two islands lie in the Upper Sonoran.

7. *The role of fire* now and for many centuries past is and has been a major one in the Californian forests. Forests of the Transition Zone, when destroyed by fire, are often completely replaced by brush lands. In areas of deficient rainfall or slopes where high erosion results in thorough denudation of surface mulch, the brush areas may become permanent on the lower boundary of the Transition Life-Zone; such an area often goes over, in its vegetation, to the Upper Sonoran Life-Zone, and displays typical chaparral.

Expression of the distribution of life by means of the life-zone concept, while imperfect, furnishes a practical working plan from which may be derived substantial and useful results, especially in the light thrown on the problem of species. Botanists in flat countries, as in the eastern United States, often evince strong distrust of the life-zone concept but it is to be said that these vegetational bands are marked actualities in a region where mountains rise from or near sea-level to heights of from 10,000 to 14,500 feet within a distance of ten to thirty miles, and where localized climatic areas bring hygrophytic forests within a short distance of arid deserts. The life-zone nomenclature has a practical value as giving expression to certain observations and will remain useful until this concept is replaced by a superior hypothesis. The concept of centers of distribution as worked out by C. C. Adams (Biol. Bull. 3: 115-131—1902; 9: 53-71—1909) is one which may give a clearer

and more truthful picture of geographic distribution. Analysis of our flora along such lines must, in the main, look to the future, although the chaparral formation has been intensively studied by W. S. Cooper and the results published in an admirable paper (The Broad-Sclerophyll Vegetation of California, 1-124, pl. 1-20). In this brief sketch of the life-zones only the broadest outlines are indicated, the statements are condensed, and the short lists of species are purely illustrative or suggestive.

Plant Distribution and Geologic History

Even an outline of geographic distribution of plants in California and the main factors causing distribution as we find it, would be incomplete without a short note on the relation of local floras to geologic history, since the earth movements on the California coast in recent geologic periods, especially since the Pleiocene, have been numerous, with subsidence and uplift of great extent. It is to such physiographic changes that we must appeal for explanation of certain restricted floras or "islands." Along the coast of California grow a number of local species, either highly localized or limited in range and thus forming "islands" or floristic remnants. Cupressus macrocarpa and goveniana form a small "island" at Monterey, Pinus radiata occurs in small "islands" at Ano Nuevo Point, Monterey, San Simeon, and on two of the Santa Barbara islands, while Pinus torreyana occurs in two small "islands," one at San Diego, the other on Santa Rosa Island. Lyonothamnus floribundus is confined to four of the Santa Barbara Islands. Pinus muricata is rather localized on the north coast.

During the Pliocene there was elevation of the whole west coast and the Sierra Nevada became elevated again. At the close of the Pliocene and in early Quaternary the elevation of the west coast continued, causing great cañons to be formed in the Sierras and Coast Ranges. In the early Quaternary the Coast Ranges stood 2000 to 3000 feet higher than now. Increasingly lower temperatures accompanied this period of elevation and culminated in the Glacial Epoch; the Sierra Nevada was covered with glaciers and a much higher rainfall prevailed than at the present time, especially in the coastal region (J. P. Smith, Sci. 30: 346-351—1909). It seems certain that during the Glacial Epoch, an extensive hygrophytic forest stretched southward along the south coast and that, due to elevation, the continental area included the Santa Barbara Islands, and that, following uplift and subsidence, more arid conditions ensued and the insular species were left as littoral relicts.

During the Glacial Epoch the main mass of the California flora of lower altitudes must have migrated southward. After the Glacial Epoch another era of subsidence began, carrying the shore line 300 to 700 feet lower than now. After this a renewed elevation was followed by a subsidence which flooded coastal valleys, resulting in the present shore-line harbors. With the final migration of the flora northward, after the Pleistocene, there was introduced or developed in the Great Valley and in the foothills a flora, profuse and diversified, that has its relationships or origins mainly with the regions southward, chiefly in northern Mexico.

The Coast Ranges are the most recent of the great structural features of California. At times, during the Eocene and Pleiocene, and again in the Pleistocene, the Great Valley was an inland sea (W. C. Anderson, Proc. Cal. Acad. ser. 4, 3:6, 7, 32—1908) and into it the sea-waters from the ocean ran through one or more of the tidal gaps of the Carquinez, Pacheco Pass, Panoche Pass and Waltham Pass. The relicts found on the summits of Mt. St. Helena, Mt. Diablo, Mt. Hamilton and Loma Prieta are doubtless connected with this history: such endemic relicts as Allium breweri, Streptanthus hispidus, Sanicula saxatilis, Phacelia phacelioides (and perhaps P. breweri), and Campanula exigua, all of which are survivals on the mountain peaks.

The Yollo Bolly, Scott, Salmon, Marble, and Siskiyou mountains form a group of chains known geologically as the Klamath Mountains (J. S. Diller, Bull. U. S. Geol. Sur. no. 196). Their rocks are older and harder than those of the Coast Ranges and similar to those of the Sierra Nevada. During the Miocene the Coast Ranges were submerged and during the Pleistocene there

was a downward movement of 1500 feet of the whole coast of northern California and southern Oregon. This succession of movements, subsidence and uplift, helps to explain localized distribution. In the region of the "Klamath Mountains" there occur a number of species restricted to that area and not recurring in neighboring areas, such as Picea breweriana, Quercus sadleriana, and garryana var. breweri, Lewisia cotyledon and oppositifolia, Draba howellii, Saxifraga fragarioides, Potentilla daucifolia and howellii, Rhamnus californica var. occidentalis, Viola cuneata, and Pedicularis howellii. There also occur in the Klamaths some equally marked or singular species which are not found elsewhere except in the southern Sierra Nevada. These are Pinus balfouriana, Erythronium citrinum, Lewisia leana, Dicentra pauciflora, Hazardia whitneyi, and Raillardella scaposa var. pringlei.

At the north end of the oblong bowl of the Great Valley the landmark of Mt. Shasta rises to 14,350 feet. It is a volcanic cone of quite symmetrical outline, save for the subsidiary cone, Shastina. The mountain is of more recent origin than the Sierran axis or Klamath group, and in consequence does not belong historically either with the Sierra Nevada or Klamath Mountains, but is a part of the volcanic chain of Cascade peaks, namely, Mt. Pitt, Mt. Mazama, Mt. Hood, and Mt. Adams. Its flora is less rich than that of the high Sierras, and although its summit for about 5000 feet lies within the Boreal Zone, it carries a less number of the boreal species that distinguish the high peaks of the Sierra Nevada, Mt. Dana, Mt. Lyell, Mt. Goddard, Mt. Whitney, and many others. Ranunculus eschscholtzii is a true boreal found on high Sierran peaks and is one of few species which goes north to the arctic circle, but it is not found on Mt. Shasta. Other boreal or high montane Sierran species not found on Mt. Shasta are Lewisia nevadensis, Draba lemmonii, breweri and glacialis, Mitella breweri, Phyllodoce breweri, Primula suffrutescens, Gentiana holopetala, Chrysopsis breweri, Hulsea algida, and Raillardella scaposa. Leucothoe davisiae of the northern Sierra Nevada does not occur on Mt. Shasta but recurs in the Klamath Mountains area westerly. Gaultheria humifusa is likewise common to the two regions just mentioned, but is not known on Mt. Shasta. This list can be extended by a perusal of the body of this text (cf. also C. H. Merriam, Biological Survey of Mt. Shasta, 75).

Lassen Peak is similar to Mt. Shasta in that it belongs to the Cascade group of peaks. While it is, like Mt. Shasta, weak in boreal elements, it is, however, only 10,437 feet in altitude and is probably relatively stronger than Mt. Shasta in true alpines. For example, Arenaria nuttallii, Draba aureola, and Gentiana newberryi are found on Lassen Peak but not on Mt. Shasta. Other species which occur on Lassen Peak but have not been found on Mt. Shasta are Trifolium lemmonii, Collomia larsenii, Mimulus leptaleus, Raillardella argentea, and Senecio pauciflorus.

The Endemic Populations

This Manual describes a total of 4019 species, 3727 of these being native plants, aside from 292 species of alien immigrants. Of these native species, 1416 species are endemic, that is, they are found only in the region covered by this Manual, the state of California. In other terms, the endemic species are about 40 per cent of the whole native population. A certain portion of the endemics have a rather wide range in the state and may be called broad endemics; other have a narrow range or are confined to a single station or a few associated stations and are called narrow endemics. Narrow endemics may be of two kinds and owe their restricted status to essentially different causes. First, we have narrow endemics which are relicts or reliquial species persisting in a locally favorable station, being remnants of a once wide distribution. Second, narrow endemics may be species which have recently originated at that station and have not yet been afforded opportunity for wide distribution. Very remarkable endemics are Lyonothamnus floribundus, Carpenteria californica and Arctostaphylos myrtifolia. On morphologic, systematic, and geologic grounds these species may be regarded as reliquial species, while on similar grounds Downingia concolor and D. ornatissima may be considered as recent species. In the case of broad endemics definite

endemism areas in certain cases emerge as our knowledge of species and their distribution becomes known in greater detail. They are closely involved with the life-zone areas and are often best considered as subareas of the life-zones with marked longitudinal limits. Some of the most outstanding or most significant of these endemism areas with their characteristic endemics I have named as follows:

1. The Low Foothill Area. An area of the Upper Sonoran Zone surrounding the Great Valley and extending out into its rolling, gravelly or more elevated plains: Pinus sabiniana, Odontostomum hartwegii, Chlorogalum angustifolium, Brodiaea multiflora and volubilis, Calochortus luteus, Fritillaria pluriflora, Chorizanthe membranacea, Silene californica, Isopyrum occidentale, Calycanthus occidentalis, Lithophragma affinis, Potentilla elata, Lathyrus sulphureus and californicus, Linum californicum, Aesculus californica, Oenothera graciliflora, Eulophus californicus, Linanthus filipes, Collinsia sparsiflora, Pogogyne douglasii, Galium bolanderi, Microseris acuminata, Lessingia virgata, Calycadenia truncata and ciliosa, and Lagophylla dichotoma. The altitudinal range of the Low Foothill Area is about 100 to 1500 (or 3000) feet.

2. The Tehaman Area. An area of the Transition Zone, forming a curved band, somewhat like an inverted U, extending from Lake Co. to Shasta Co. around the head of the Sacramento Valley, thence southerly from Shasta Co. to Mariposa Co., at about 3000 to 7000 ft. Sometimes an endemic of this area extends into southern Oregon. The following are to be noted: Cupressus macnabiana, Schoenolirion album, Calochortus coeruleus and nudus, Polygonum davisiae, Eriogonum ursinum, Berberis pumila, Peltiphyllum peltatum, Boykinia major, Brickellia greenei, Madia bolanderi, Senecio mendocinensis, Crepis acuminata var. pleurocarpa, and Erigeron miser. The climatic significance of this area is emphasized by species of Washington and Oregon which enter it from the north and whose range in California is nearly or quite coextensive with the area: for example Melica subulata, Carex densa and laeviculmis, Lithospermum ruderale and Chamaesarcha nana.

3. The Tehachapan Area. An area somewhat like an ox-bow set on end, extending in the Transition Zone from the San Bernardino Mountains through the San Gabriel Mountains to Mt. Pinos and Frazier Mountain, thence through the Tehachapi Mountains to the southern Sierra Nevada in Kern and Tulare counties: Oxytheca parishii, Potentilla wheeleri, Astragalus pachypus (at low altitudes), Collinsia childii, Pentstemon rothrockii, Aster adscendens var. delectabilis, Wyethia ovata, Chaenactis santolinoides and Senecio ionophyllus. The genus Oreonana is limited to this area.

4. The Mohavan Area. An area of the lower Sonoran Life-Zone, about coextensive with the Mohave Desert: Calochortus palmeri, Chorizanthe spinosa (a narrow endemic), Oxytheca watsonii and luteola, Canbya candida, and Nicolletia occidentalis.

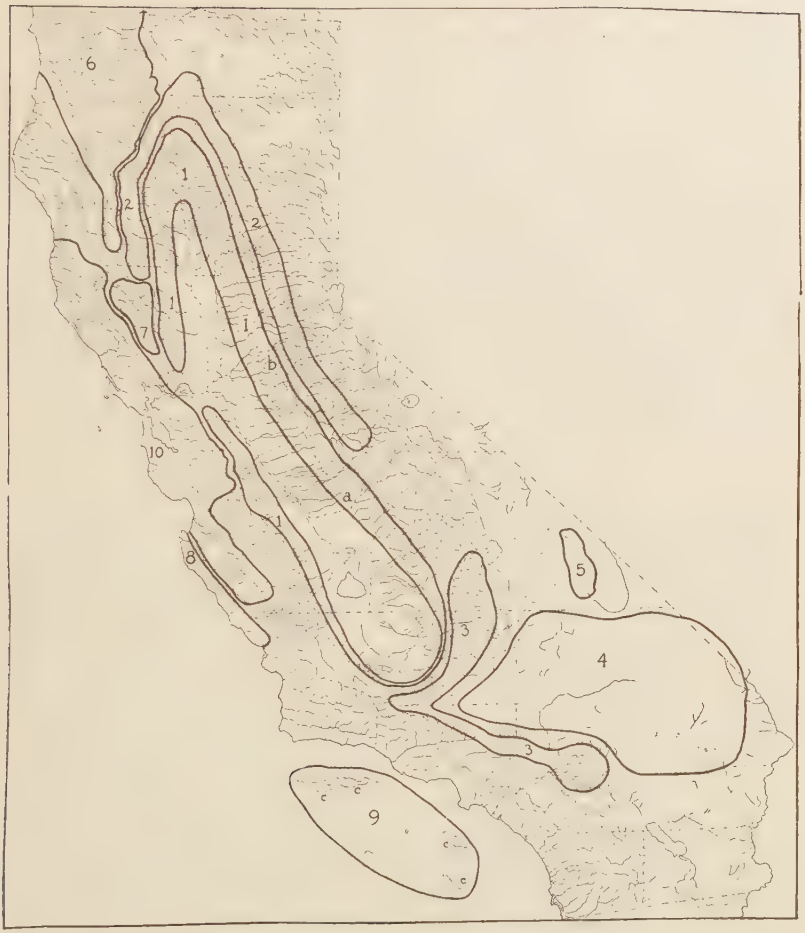
5. The Death Valley Area. An area of the lower Sonoran Life-Zone inclusive of the bounding foothills of Death Valley: Phyllogonum luteolum, Boerhaavia annulata, Oxystylis lutea, Astragalus atratus var. panamintensis, Brickellia knappiana, Salvia funerea, Viguiera reticulata and Enceliopsis argophylla var. grandiflora.

6. The Klamath Area. Described above in the section on Geologic History.

7. The Napa-Lake Area. An area including the lower mountains (800 to 3000 ft.) and valleys in northern Napa Co. and Lake Co.: Brodiaea rosea, Chorizanthe clevelandii, Delphinium uliginosum, Astragalus clevelandii, Antirrhinum virga, Cordylanthus pringlei, Senecio greenei and clevelandii, and Arctostaphylos elegans. Raillardella scabrida and Epilobium nivium are at higher altitudes on the north side of this area.

8. The Lucian Area. This area includes the Santa Lucia Mountains, the only mountain range of the California coast overhanging the Pacific Ocean: Abies venusta, Cupressus goveniana, Chorizanthe vortriedei, breweri and palmeri, Streptanthus lemmonii, and Ribes sericeum.

9. The Santa Barbara Insular Area. An area which includes all the Santa Barbara Islands: Dissanthelium californicum, Quercus tomentella (also on Guadalupe Isl.), Eriogonum arborescens and giganteum, Arabis filifolia,



Some Endemism Areas in California. The numbers on the map refer to the numbered paragraphs on pages 12 and 13. The letters refer to three remarkable endemics: *a,* Carpenteria californica; *b,* Arctostaphylos myrtifolia; *c,* Lyonothamnus floribundus.

Ceanothus arboreus, Convolvulus macrostegius (also on Guadalupe Isl.), Phacelia lyoni, Hieracium argutum, Hazardia cana, and Hemizonia clementina.

10. The Franciscan Area. This is an area extending from northern Monterey County to southern Mendocino County. It contains a large population of endemic shrubs (Jepson, Fl. W. Md. Cal. ed. 2, 4), and it is thought, a larger number of endemics than any other endemic area in California, but the area has not, as yet, been sufficiently studied from this viewpoint and its geographic limits are not clearly determined. Only a few species can here be listed: Iris longipetala, Chorizanthe pungens, Montia gypsophiloides, Arabis blepharophylla, Acaena pinnatifida var. californica, Thermopsis macrophylla, Hystrix californica, Ceanothus foliosus, papillosus, sorediatus and

incanus, Dirca occidentalis, Navarretia abramsii, mellita and heterodoxa Orthocarpus floribundus, Cordylanthus mollis, Corethrogyne californica, Lessingia ramulosa, Micropus amphibolus, Layia chrysanthemoides and calliglossa.

The Alien Populations

Exotic species which have, through accidental or other introduction, become an integral part of the California flora number 292. These immigrants have been derived from all continents of the earth but chiefly from the Mediterranean region. The number 292 gives no proper concept of these alien populations, since the species are often very aggressive, produced in countless numbers of individuals and have an important significance in relation to the dominance or persistence of native species which, in many cases, they successfully disposess. In the low valleys and in the open foothills there are many districts where the aliens make 50 to 75 per cent of the total population. Only aliens which are really established and have a true competitive status are included in this text. Many alien species that have been introduced are not as yet well established or are only accidental or casual and often disappear. Likewise are excluded those cultivated plants which are transiently spontaneous or which may persist only in a protected spot.

The Concept of Genera and Species

The treatment of genera and species in this work differs markedly from that of certain authors, more particularly from those who have published new genera and species in an isolated manner and not in revisions, monographs or floras. The differences are sometimes very great, as, for example, in the genus Eschscholtzia. This text includes 7 species for California; Fedde in Das Pflanzenreich makes 100 species as occurring in California. The genus Ptelea is represented by one species as viewed by this Manual; Greene (Contrib. U. S. Nat. Herb. 10) has 6 species for California. Such instances might be multiplied almost indefinitely, and necessitate a statement as to the principles worked out and employed by the writer in the preparation of his systematic papers. A genus, in the view of the writer, should include all species of close genetic connection which have a marked natural resemblance or are closely bound together by structural peculiarities which indicate a close line of descent or form a compact natural group. Genera so founded are sufficiently large to establish relationships on a recognizable scale and to bring out the intimate relationships which exist between floras of different regions or countries as a result of past migrations. Genera having marked characters should not be subject to a segregation which reduces the generic character to the level of a species character. It is, however, necessary that the limits of genera should, with increase of knowledge of their structure, probable phylogeny, geographic history and ecology, be subject to revision and modification. No genus has any vested rights on account of long usage or approval by great masters. Continued research, increased knowledge and an enlarged viewpoint must continually find vent in new generic expressions. Otherwise devotion to the past becomes a species of mental slavery wholly at variance with the spirit of scientific research.

Similar observations apply to the species unit. It must consist of individuals having the same genetic constitution, that is, bound together by intimate genetic connection as determined by the morphology, detailed structure, life history, genetic evidence, geographic history and ecologic status. The species should represent a natural unit, more especially from the geographic standpoint. It should be, as an objective aim, distinguishable from related units. It must have practical value or utility, that is, it must be useful in the scientific sense. Every effort should be made to give it clear definition. Ordinarily such a species will possess structural and ecological characters by which its identity can be established. Since species are so much more numerous than genera, the problems have likewise been more numerous than in the case of genera. Investigation by the author of a vast amount of original plant material and of a very large number of segregate

species published for California and its neighboring states has developed certain guiding principles which are here set down as a condensed outline of his practice and serve to indicate broadly his mode of research, and the principles on which that mode is based.

1. Range of Variation. By measurements and observation it has been the practice to secure as full data as is possible regarding variation in the organs of a species, especially from one individual or from a series of individuals, where these have common parentage, either directly known or obviously inferred. Such a mass of statistics is of primary importance in the problems of species.

2. Special Morphology. By field observations, by garden cultures or by laboratory methods the structure, character and presence or absence of plant organs has furnished invaluable data for determining the validity of species. The specific mark of a segregate, for example, is often described as the possession of an organ which is, in reality, present in all the segregate forms referred to. On the other hand microscopic study of morphologic detail has often revealed structural differentiae of the greatest importance for segregating new species or validating old ones. An illustration of the latter instance is afforded by the study of the trichome-like processes in the glands of Calochortus which furnished a new and more satisfactory basis for species differentiae in that genus (Jepson, Fl. Cal. 1: 291-302).

3. Life History. The entire life history of the plant forms an invaluable record in determining relationships and phyletic descent, because the successional stages of development in the individual exhibit certain characters or structures which, as critically weighed, are repetitions in a greater or less degree of the history of its race or line. This theory is summarized in the well-known biogenetic law, a renewed and able defense of which has recently been made by E. C. Jeffrey (Sci. 60: 531—1924). Osmaronia cerasiformis, a well-known species of the soft chaparral, belongs to the family Rosaceae, a family characterized by the presence of stipules. In Osmaronia stipules are absent or feebly developed only on young shoots; they are, when present, short vestigial structures and significantly indicative of ancestry. In connection with this general principle, it is to be noted that juvenile characters in certain individuals are sometimes prolonged or reappear in the adult stage, and have been seized upon as the basis for specific segregates. In addition specimens which merely represent extreme maturity on the one hand or extreme youth on the other, are frequently used as the basis for specific segregates. This is so commonplace that it would not require mention save that segregates with such a basis are sometimes published at botanical centers of admittedly high reputation. In general fuller data regarding juvenile stages are available than are data regarding extreme maturity, especially the stage of senescence or of death. An illustration of the value of what I here call a *senescence character* is furnished by Cordylanthus pilosus, in which the writer has observed that the lower of the two sepals is deciduous in extreme age. This is a true senescence character. This species belongs to the subgenus Eucordylanthus, in which the calyx is diphyllous; in the section Hemistegia, which is here regarded as congeneric with Cordylanthus and not accepted as a separate genus, the calyx is monophyllous from the beginning, the upper sepal only being present. Physocarpus capitatus, a shrub of the soft chaparral, loses its stipules in extreme maturity and fails, therefore, to show a well-known family character at this stage. The valves of the capsule in Juncus drummondii become more distinctly retuse after dehiscence, in extreme age. This mark of senescence is a valuable specific character. All such instances, which appear like departures from the set family, genus or species character, should not be regarded by the student as annoying or irritating exceptions but as evidences of evolutionary trend which are full of genetic significance and pregnant with phyletic meaning.

4. Mutilation. Excision of the crown of an adult individual or of a portion of it or of particular organs or parts of organs, under appropriate conditions, often results in the production of a range of form not normally exhibited by the individual or not at that age. Such structures often throw

valuable light on phylogeny. Annual species of Gilia, as an example, are often characterized by early or basal leaves of quite different shape or size from the floral leaves. By mutilation, a plant may be induced to exhibit only the type of leaves associated with the flowering stage. Not infrequently accidental mutilation may occur in a state of nature and individuals of this sort have been collected and, by certain authors, named and described as if good species.

5. Garden Cultures. Very few native plants have as yet been treated as cultures. This work is necessarily a slow one but the practice yields invaluable data regarding genetic relations and specific limits. As an illustration the case of Eschscholtzia may be cited. By transplanting individuals of Eschscholtzia californica from the Great Valley to the seacoast the writer was enabled to observe changes in a given individual which corresponded to characters of certain so-called segregates, while in the Great Valley he was enabled to demonstrate (Fl. Cal. 1:564-572) that one individual showed successively, during the long flowering period, certain phases which correspond with some five or six of the most extreme segregates in the large number of segregates artificially split away from that species. This work had great significance because it justifies the reduction of Eschscholtzia species from the total of 123 to a much smaller number, say about 10 or 20. Important results in the case of other genera are also on record.

6. Field Studies. The importance of field studies cannot be overestimated, for it is in the field that plants are growing under natural conditions. The most valuable records are those which relate to habit, life-history, soil, exposure, and associated species. The array and inter-relationship of forms in a plant community provides an exhibit of living phenomena which suggests solutions or clews to many problems which may be further developed by critical investigation. Vestigial structures often have great weight in relation to phylogeny and are often most easily discovered or clearly perceived in the field; while excellent examples of range of variation in organs can often be satisfactorily worked out in the field. For this purpose, in the course of the author's investigations, expeditions have been made to all parts of California over a period of several decades and have always been fruitful of results.

7. Indication of Range. No two species react similarly to a given combination of the climatic factors, but for each species there is an optimum area where it has its greatest development. In this area of greatest development the species has greatest range of tolerance and often grows in the widest variety of situations. As it radiates from this area it shows a more and more limited tolerance along each of the various lines of radii; that is, each radius exhibits it as keeping to a narrower and narrower set of conditions until the species reaches its limits. Since a species can, in certain respects, be studied to greatest advantage at the limits of its range, an attempt is here made to indicate range limits more accurately than has hitherto been attempted.

8. Bio-geographic Status. Most species grow under a comparatively narrow range of climatic conditions. The determination of geographic position and climatic status is always of importance in relation to validity of species. It not infrequently happens that the range of a species is successfully predicted in advance of exploration. Contrariwise it often happens that plants published as separate species but without geographic data seem, on the basis of their descriptions, lacking in the essentials of good species. It not infrequently fails out that the later investigator of such proposed species is enabled to determine that the forms in question belong to the same division of a life-zone, and he is thus afforded helpful clews to, or even essential confirmation of, specific identity. Complete elucidation may follow naturally from the known laws of geographic distribution in the region.

9. Field Records. Records of observations or experiments in the field, must, in order to have real value, be made on the spot and at the time, and be further validated by herbarium specimens. Truly useful herbarium specimens consist of ample series and represent the widest possible phases of the life history.

10. Writing of Diagnoses. The writing of diagnoses proceeded upon a definite plan, in order to give the best possible expression to the author's results. The ideal descriptions give an exposition of relationships and phylogeny which is in as nearly complete accord as possible with the facts of nature. All data, structural, morphological, ecological and physiological may aid in this task, while of course the herbarium is a constant resource. The construction of diagnoses, according to such a standard, is one of intense and prolonged labors, but such work not only serves to approximate a truthful account of the flora of a region but it also affords a means of judging proposed new species. The original description of a species and the type specimen are invaluable for determining identity, but that once done, the original description has served its purpose. It is necessary that this original description, resting commonly on few individuals, or on a single one, or even on a slight fragment, should be supplanted by a diagnosis of the species which covers the species population as the species exists in a state of nature. Imperfect or diluted original descriptions have been made, too frequently, a plausible pretext for publishing segregates without real value. The writing of sound diagnoses is a highly important art because it helps to stabilize specific units.

It might seem that such a procedure as has been indicated is so obvious or so natural as not to require a statement of this kind. On the contrary, descriptions in certain floras are so frequently copied from other works that the fact of copying has come to be assumed, by many botanists, as if it were universal in the case of floras. Even E. Warming (Oecology of Plants, 1) speaks of "the compilation of a Flora." New descriptions, the result of prolonged field studies or garden experiments and containing new life-history material, are by the copyist conveniently copied, not infrequently under the impression that these descriptions are themselves copied ones. Even the copying of good descriptions serves no useful purpose, simply because the making of floras by copying results in a mass of unrelated and unorganized material, a way of doing things which has done much to promote the multiplication of useless species.

11. Scientific Approach. All problems of relationships and phylogeny that arise in a group must be resolved and interpreted after acquiring ample knowledge of the group and after fullest determination of the facts, without preconceived rules or prejudice. This is so well known and so fundamental a principle that it scarcely requires mention here, save that a contrary principle embodied in an ancient fallacy constantly reappears under a new and often engaging guise. By some method, it is said, the riddle of relationships for all plants can be solved: by the use of physiological traits, by the use of the carpel, by the use of stamens, by the use of biometric measurements (and so on down through the centuries), the species of the books may, by a given method, be made uniform. The answer to this is that characters of evaluation for a given group cannot be determined in advance. This matter can be partly illustrated by the writer's studies on the genus Arctostaphylos. From the standpoint of the practice of evaluation by morphologic characters, or by biometric measurements or by any other method determined in advance, scarcely more than five or six species could well be recognized for California. In this Manual 25 species are described, a larger number for California than has hitherto been accepted in any work. Based upon morphologic character these 25 species fall into a number of groups of 3 or 4 species each, the species being separable in herbarium specimens only by minute differences in pubescence, glaucescence, or foliage and the like, too slight for good evaluation. In their relation to chaparral fires, however, the species within each group react in a fundamentally unlike manner—some kill outright under fire of even slight intensity, others lose their crowns, but persist by root-crown sprouting even after the most destructive of chaparral fires. That is, the responses are constant and fundamentally unlike. This specific segregation is further correlated with geographic and ecologic segregation and we have an excellent example of the working out of what I have called the *biogeographic principle* (Jepson, Madroño, 1: 76-96). This one illustration proves sufficiently that a scientific method cannot be determined in advance.

Climatic and Edaphic Variations and Parallel Variations

The object of the diagnoses is to set forth the families, genera and species by descriptions based upon the prevailing or dominant type in each rank. It is hoped in this way to exhibit as clearly as possible the probable phylogeny, so far as it can be done in a linear sequence, and to bring out the salient facts which indicate relationship. No attempt is made to cover the range of mutating or fortuitous variation, or the ordinary climatic or edaphic variations. To do this fully in all its bearings might well require a volume of this size for a single species. To expect a diagnosis to apply exactly to an individual rather than to the species population which it describes is to demand that species be fixed invariable entities. No biological fact is, perhaps, better established than the fact of variation. No two individuals of any species of a seed-plant, we will say, are exactly alike. The student should, therefore, when making determinations, assemble by dissections and by observations and records the fundamental morphologic evidence in connection with field data. He should bear constantly in mind that careful determination represents exercise of the critical faculties. Even professional botanists sometimes imagine that the identity of a species and its phylogenetic position can be named offhand. This is merely a notion, and is, of course, entirely fallacious. For these reasons, the inexperienced user of this Manual should keep in mind the principle of non-inherited variations. A few illustrations of climatic and edaphic variations of this sort are indicated as follows:

1. Plants in rich soils or unusually favorable moisture conditions become much larger or ranker than the average of the species. One must, to be sure, on the one hand, distinguish between seasonal or local rankness and, on the other hand, large forms which represent gigantism, a condition which is inherited. Minor and major forms occur in many genera. Typical Brodiaea laxa represents gigantism; its minor form is var. nimia. Typical B. coronaria is a minor form which has a major form in var. mundula.

2. In sterile soils or under unfavorable seasonal conditions a species may develop very small individuals, much smaller than described for the species This is particularly true of the large number of annuals in the Californian flora. A single illustration will suffice. In Sierran swales or under forest untold millions of individuals of Gilia leptalea, simple-stemmed and only 1 to 3 inches high, grow in the granite sand. This species at lower altitudes is normally branched and 10 to 18 inches high. Extensive areas of dwarfs occurring with such marked uniformity are, to be sure, worth ecological notice, but they do not represent a genetic variation. One must again, however, distinguish between these seasonal dwarfs and true pygmies, the latter representing nanism which is inherited.

3. In many species size of flowers or size of heads is proportionate to size and vigor of the individual plants. Pentachaeta bellioides furnishes a striking illustration.

4. In wet soils or in swamps the plant tends to become succulent and also glabrous.

5. In valley loams growth is commonly much more rank than on hillsides or clay flats.

6. On hilltops plants tend to become dwarf and also stemless, as is frequently seen in the case of Eschscholtzia californica.

7. In cold soils or in beaten ground, stems and branches often tend to spread or even to become prostrate.

8. In strongly alkaline valleys or near the sea the tissues of individuals often tend to become more succulent or fleshy.

9. In subsaline soil the stems and foliage of many species are more vigorous and the flowers larger than on stiff clays or adobes.

10. In the deep shade of woods leaves become thinner and larger, the internodes longer and the plants taller. In the shade of Redwoods on upper San Leandro Creek, for example, the shrub Cornus californica exhibits leaves 3 to 5 inches long; in the open 100 yards distant, its more usual situation, the leaves are 1 to 2 inches long and much thicker in texture. In shade, also, plants tend to become glabrous.

11. In intense sunlight plants tend to be compact with short internodes and small leaves.

12. At high altitudes the flowers are larger in proportion to stature and brighter in color.

13. Plants growing in water have longer internodes and longer and often pointed leaves as compared with the terrestrial form with shorter blunt leaves. Jussiaea californica in deep water has elongated pointed leaves; the terrestrial form has shorter internodes and short and broad subrosulate leaves very obtuse at apex.

14. Plants growing in dry places or in situations which inhibit vigorous growth sometimes have entire leaves instead of serrate ones, as is the case with Pentstemon newberryi growing on lava cones.

15. Plants growing normally in wet or moist situations sometimes tend to become spinescent in arid situations, as is the case with Navarretia leucocephala.

16. Plants which in their early stages are subaquatic and produce fistulous phyllodes at this stage fail to develop phyllodes in dry seasons, though going on to maturity, as in the case of Eryngium vaseyi.

17. In early and warm rainy seasons annuals and biennials sometimes tend to become perennial.

18. Habital similarity of unrelated species. The phrase habital similarity, as here used, refers to the appearance of parallel or analogous structures in unrelated species, the structures evidently representing adaptation or physiological response to a like combination of the climatic and edaphic factors. A few apt illustrations may be grouped in types which I have named as follows:

A. *Polymitism* (*Mitophytes*). Represented by annuals with numerous filiform or slender stems having a "bushy" habit, illustrated by such unrelated species as Eriogonum spergulinum and Nemacladus ramosissimus.

B. *Prophalism* (*Prophalophytes*). This habit is assumed by annuals which produce a single flower or a single head or a single spike of flowers at the ground under the earliest seasonal impulse, further growth being inhibited by dryness; or on the other hand, if favorable conditions continue, there will ensue a development of many ascending or decumbent branches proliferous from beneath the initial flowering, these later shoots giving rise to profuse flowering. This habit guarantees at least some seed in case of seasonal drought and occurs in such plants as Navarretia prostrata and Oenothera trichocalyx, species from families widely separated phylogenetically.

C. *Simulism* (*Simulophytes*). This is a case of pure habital similarity, a similarity in branching, in hue or in foliage, and is illustrated by the resemblance of such widely unrelated pairs of species as the following: forms of Navarretia squarrosa to forms of Centromadia pungens; Collomia rawsoniana and Clinopodium mimuloides; Lomatium parryi and Cymopterus anisatus (of the Great Basin); early stages of Dodecatheon jeffreyi and Rumex occidentalis.

D. *Proliferism* (*Proliferophytes*). Certain species with a slender stem or main axis produce proliferous branches and in habit assume analogy to other species, as: Pentachaeta exilis, Rigiopappus leptocladus, Navarretia prolifera.

Obviously the student should be on his guard, against being misled by analogies or superficial resemblances, especially in the absence of reproductive organs from the material. A specimen of an old and well-known California species of Prunus (family Rosaceae) has recently been published by an American botanist as a new species of Lycium (family Solanaceae). He was misled by habital similarity due to definite external conditions ("epharmonic convergence"). The student, therefore, should always secure the fullest possible evidence from the sexual reproductive organs, especially the gynoecium or pistil, because the reproductive organs are, as to structure, removed (normally) from external influence. On the other hand the vegetative organs are freely subject to edaphic influence because they are directly concerned with the struggle for existence in the individual. In determining the morphologic value of an organ the facts should be established in the order of their importance, namely: 1. Position (the most important consid-

eration). 2. Structure (also highly important). 3. Shape (of secondary value). 4. Size (of quite secondary value). 5. Color (its value is very slight). If the plant or material bears no sexual reproductive organs the student should observe great caution and reserve in determining its systematic affinities or phylogenetic position.

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NOTE ON THE ACCENTUATION OF THE LATIN NAMES

By CORNELIUS BEACH BRADLEY, LL.D.

The scheme for marking the accentuation of plant-names in this work is that used in the current manuals. Both the acute and the grave accent-marks indicate that the vowels to which they are attached are to be stressed; but the acute [´] indicates further that vowel has its long sound in English, while the grave [`] indicates either its short sound or some other variation from the long. The accepted accentuation has been followed save in a few cases where it has seemed to be clearly mistaken. One such case is the little group of English surnames like *Forbes* and *Jones*, in which the *e* is silent, and the words are monosyllabic. There seems to be no good reason why the addition of Latin suffixes should not only give sound to the silent *e*, but also ridiculously lengthen it. I have therefore treated all such stems as monosyllabic, precisely as *Johns* would be treated in like circumstances; as, e. g. *Jón[e]si*, *Jón[e]sia*, *Jón[e]siána*, etc. Another such group are the personal names ending in *-son*, with short, unstressed *o*. All the Latin forms built up from such stems have therefore been accentuated on that basis, thus: *Jòhnsoni*, *Jòhnsoniána*, but *Johnsónia*.

In Latin, moreover, there are many quasi-compounds, like our hyphenated compounds, in which both elements retain their separate accentuation. Such a compound is *sempervirens*—cf. *Oxford Dictionary* s.v. *Semper*. Naturally, therefore, the word has been regularly pronounced *sémpervìrens*—both by scholars and laymen. But some wiseacre has made the discovery that the *i* of the penult is short, and a determined effort seems to be made to spread the "correct" pronunciation *sempèrvirens!* The matter would deserve no notice here were it not that the attempted innovation seems almost an insult to our noble Redwood.

There remains a word more to be said concerning the unlucky suffix *-oides*, which seems to be generally mispronounced as a dissyllable, with the *o* and *i* coalesced into a diphthong, after the analogy of *ovoid*, *thyroid*, and *mastoid*. All such tabloids are of modern manufacture, and suited to the haste and impatience of our modern life. But *-ŏ-ĭ-dēs* is a leisurely and dignified mouth-filling trisyllable, and has been such at least ever since the Trojan War.

GENERAL KEY TO THE FAMILIES

I. Subkingdom **PTERIDOPHYTA**, Fern Plants

Plants with typically distinct alternation of generations, the leafy plant (sporophyte) reproducing by non-sexual spores. Spores developing prothallia or flat plates of tissue (gametophyte) bearing antheridia (containing male cells or sperms) and archegonia (containing a female cell or oospore). Oospore fertilized in the presence of water by a self-motile sperm. Flowers or seeds none. Ours herbs.

Stems not jointed or rush-like.

Stems small in comparison with the leaves, often very short, usually unbranched.

Land plants, or at least essentially terrestrial; sporangia borne on the lower side or edges of the leaves; spores all of one kind and size (isosporous).

Leaf 1, erect in the bud; sporangia borne in spikes, the spikes simple or branched, not green...Ophioglossaceae, p. 25.

Leaves several to numerous, circinate in the bud, often large and characteristically much-divided; sporangia borne in clusters (sori) on the back or margin of green leaves.....
Polypodiaceae, p. 26.

Aquatic or subaquatic plants; sporangia and spores of 2 kinds.

Sporangia borne in special conceptacles; stems not corm-like.

Plants floating in water; leaves minute, entire or 2-lobed....
Salviniaceae, p. 39.

Plants rooting in mud; leaves 4-foliolate or filiform.....
Marsileaceae, p. 39.

Sporangia borne in the leaf-axils; leaves awl-like or linear, clustered on a flattened or corm-like stem..Isoetaceae, p. 43.

Stems more or less elongated, freely branching, closely clothed or imbricated with small awl-like or scale-like leaves; sporangia borne in or near the leaf axils.

Spores of one kind.....Lycopodiaceae, p. 41.

Spores of two kinds.....Selaginellaceae, p. 41.

Stems jointed or rush-like, hollow, the reduced leaves joined into a toothed sheath at the nodes; sporangia borne on the under side of the scales in a terminal cone-like spike; spores of 1 kind.....Equisetaceae, p. 39.

II. Subkingdom **SPERMATOPHYTA**, Seed Plants

Plants without distinct alternation of generations, the sexual phase (gametophyte) much reduced and parasitic upon the sporophyte; egg-cell fertilized through the intervention of the pollen-tube, the developed embryo forming a resting body called a seed.

Class 1. **GYMNOSPERMAE**, Cone-bearing Plants

Ovules and seeds borne naked on the surface of a scale; stamens and ovules in catkin-like clusters; cotyledons 2 to 17; cone-bearing trees or shrubs, all of ours evergreen; true flowers none; leaves needle-like, narrowly linear, awl-like or scale-like.

Trees, rarely shrubs, with resin.

Fruit a woody cone (soft and berry-like in Juniperus), containing several to many seeds; ovules in catkins.

Cone-scales imbricated, with a conspicuous or minute bract at base on lower side; leaves needle-like or narrowly linear; seeds 2 to each scale, bearing a thin wing.....Pinaceae, p. 44.

Cone-scales without bracts.

Leaves narrowly linear and 2-ranked in flat sprays, or lanceolate or awl-like and disposed all around the branchlet; cone-scales not imbricated, ending in broad flattish summits; seeds 2 to 9 to each scale, not winged.....TAXODIACEAE, p. 54.

Leaves minute and scale-like, thickly clothing the ultimate branchlets; cone-scales imbricated, or with broad flattish summits and not imbricated; seeds 1 to several to each scale, winged or wingless.....CUPRESSACEAE, p. 55.

Fruit berry-like or drupe-like, one-seeded; ovules solitary; leaves narrowly linear, in flat sprays.....TAXACEAE, p. 59.

Shrubs without resin; deserts.....GNETACEAE, p. 60.

CLASS 2. **ANGIOSPERMAE**, FLOWERING PLANTS

Ovules borne in a closed sac or ovary, which becomes the fruit and encloses the seed; cotyledons 1 or 2; plants with true flowers, typically with an abbreviated stem (receptacle) bearing regular whorls of perianth parts, stamens, and pistils.

SUB-CLASS 1. **MONOCOTYLEDONEAE**

Leaves parallel-veined (except Trillium); parts of the flower usually in 3s, rarely in 2s, 4s or 5s; vascular bundles scattered irregularly through the pithy tissue, not in rings or annual layers; embryo with 1 cotyledon; perennial herbs commonly with rootstocks or bulbs, or annuals, or a few trees or shrubs.

A. PERIANTH NONE OR CALYX-LIKE WITH SCALE-LIKE DIVISIONS; PARTS OF THE FLOWER MOSTLY UNEQUAL IN NUMBER; CARPELS 1 TO SEVERAL, DISTINCT, OR SOMETIMES UNITED BUT SEPARATING AT MATURITY.

1. *Flowers not in the axils of dry chaffy bracts; ovary superior; herbs.*

Leafless minute aquatics, the stems represented by leaf-like floating fronds.....LEMNACEAE, p. 194.

Leafy plants.

Immersed aquatics; leaves filiform or linear, or some floating ones with broad blades; flowers inconspicuous, naked or with a very small calyx, borne on a spike or spadix; stamens 1 to 4; ovaries 1 to 4...NAIADACEAE, p. 63.

Plants of marshes or rising out of water.

Flowers monoecious; reed-like plants with linear leaves.

Inflorescence a dense cylindrical spike.....TYPHACEAE, p. 61.

Inflorescence a dense globose head.....SPARGANIACEAE, p. 62.

Flowers perfect, rarely polygamous, in racemes or spikes.

Inflorescence with a spathe; calyx none; stamens 6.....ARACEAE, p. 193.

Inflorescence naked; calyx of 6 (or 3) distinct sepals, or none; stamens 6 or 1.....JUNCAGINACEAE, p. 68.

2. *Flowers in the axils of dry chaffy bracts, arranged in spikes or spikelets.*

Stems mostly terete and hollow; leaves in 2 rows; sheaths mostly split open opposite the blade; bractlets 2 to each flower; fruit a grain (seed mostly adnate to the pericarp).....GRAMINEAE, p. 72.

Stems mostly triangular, solid; leaves in 3 rows; sheaths entire; ligule obsolete or minute; bractlet 1 to each flower; fruit an achene (seed free from the pericarp).....CYPERACEAE, p. 144.

B. PERIANTH ALWAYS PRESENT, ITS SEGMENTS IN 2 SERIES, RARELY IN 1, OFTEN COROLLA-LIKE; PARTS OF THE FLOWER USUALLY EQUAL IN NUMBER; CARPELS UNITED INTO ONE COMPOUND OVARY (EXCEPT ALISMACEAE).

Inflorescence without a spathe.

Pistil 1.

Ovary superior; perianth regular; stamens 6, sometimes 3 or 4.

Perianth-segments distinct, green or brown, not petal-like; flowers small or minute; rush-like plants....JUNCACEAE, p. 196.

Perianth-segments distinct or partly united, at least the inner petal-like; flowers mostly showy; plants not rush-like.....
LILIACEAE, p. 208.
Ovary inferior; flowers perfect, mostly conspicuous; perennial.
Perianth regular; ovary 3-celled.
Stamens 6; leaves (in ours) fleshy, in a basal rosette.....
AMARYLLIDACEAE, p. 252.
Stamens 3; leaves 2-ranked, sword-like and sheathing.....
IRIDACEAE, p. 253.
Perianth irregular; stamens 1, rarely 2; ovary 1-celled; leaves sheathing, often reduced to scales...ORCHIDACEAE, p. 255.
Pistils several, distinct, 1-celled, superior, becoming achenes; perianth of 3 sepals and 3 petals; stamens 6 to many.....ALISMACEAE, p. 69.
Inflorescence with a spathe; pistil 1.
Herbs.
Ovary inferior; 1 to 3-celled; stamens 3 to 12; aquatic plants; leaves opposite or whorled.....HYDROCHARITACEAE, p. 72.
Ovary superior.
Aquatic plants; leaves ribbon-like.....PONTEDERIACEAE, p. 195.
Marsh or bog-perennials; leaves broad.....ARACEAE, p. 193.
Trees; flowers on a spadix or fleshy spike.....PALMACEAE, p. 193.

SUB-CLASS 2. DICOTYLEDONEAE

Leaves commonly netted-veined; parts of the flower mostly in 4s or 5s; vascular bundles in a ring around a central pith, the stem, when perennial, increasing in girth by annual layers; embryo with 2 cotyledons; herbs, shrubs or trees.

I. **APETALOUS DIVISION.** Corolla none; calyx present, herbaceous or often petal-like, sometimes none.

A. Flowers monoecious or dioecious, one or both kinds in catkins; trees or shrubs.

1. Leaves opposite.

Flowers dioecious.
Catkins erect; maritime shrub.....BATIDACEAE, p. 340.
Catkins drooping; montane shrubs.....GARRYACEAE, p. 731.
Flowers monoecious; ovary superior, 2 or 3-celled.....BUXACEAE, p. 606.

2. Leaves alternate.

Both kinds of flowers in catkins.
Flowers 1 to each scale or bract; calyx none.
Fruit a 1-celled many-seeded capsule; seeds with a coma; flowers dioecious; foliage deciduous.....SALICACEAE, p. 261.
Fruit waxy-coated, berry-like; flowers monoecious or dioecious; foliage evergreen or deciduous.....MYRICACEAE, p. 279.
Flowers 2 or 3 to each scale or bract; calyx present; staminate catkins long, pendulous, the pistillate small, spike-like, maturing into a woody cone containing small nutlets.....BETULACEAE, p. 269.
Only the staminate flowers in catkins, the pistillate flowers solitary or clustered, rarely in catkins.
Leaves simple.
Fruit a nut set in a scaly cup or bur (acorn or chestnut).....
FAGACEAE, p. 271.
Fruit a nut enclosed in a leafy tubular involucre..CORYLACEAE, p. 270.
Leaves pinnately compound; fruit a nut with a fibrous coat.....
JUGLANDACEAE, p. 279.

B. Flowers perfect or unisexual, not in catkins.

1. Ovary superior, that is, free from the calyx.

a. Flowers hypogynous.

* Calyx present; corolla none.

Pistil one.
Ovary 1-celled; styles or stigmas 1 or more than one.
Fruit indehiscent (circumscissile in some Amaranthaceae).
Fruit dry (an achene or utricle); stamens 1 to 9.
Herbage with stinging hairs; flowers very small, monoecious, in a catkin-like inflorescence; sepals 4; stamens 4; herbs.....Urticaceae, p. 280.
Herbage without stinging hairs.
Plants commonly scurfy, of alkaline or maritime habitat; sepals herbaceous, or in unisexual flowers, the pistillate without calyx and enclosed by 2 bracts; bractlets none; stamens 1 to 5; leaves alternate, rarely opposite or leafless; stipules none.....
Chenopodiaceae, p. 319.
Plants not scurfy.
Calyx not tubular; leaves alternate or opposite or basal.
Fruit a triangular or lenticular achene; calyx colored or herbaceous, 5 or 6-cleft or -parted; flowers with or without bractlets; stamens 3 to 9; stipules present or none.....Polygonaceae, p. 286.
Fruit a utricle; calyx scarious, 5 or 3-cleft or -parted; flowers with bractlets; stamens 3 to 5 (rarely 1); stipules none.....
Amaranthaceae, p. 333.
Calyx tubular, corolla-like, the base of the tube hardening and enclosing the achene; stamens 3 to 5; leaves opposite, without stipules.....
Nyctaginaceae, p. 335.
Fruit fleshy.
Fruit a berry; leaves triternately compound; herb.....
Actaea, p. 374.
Fruit a drupe; leaves simple, alternate.
Sepals 6, petal-like, distinct; stamens 9, the anthers opening by valves; evergreen tree.Lauraceae, p. 396.
Calyx 5 or 6-parted, greenish; stamens 5 or 6, the anthers opening by longitudinal slits; deciduous tree...
Ulmaceae, p. 282.
Fruit dehiscent (a capsule); leaves opposite.
Calyx synsepalous, 5-lobed.
Stipules none; erect perennial herb.....Glaux, p. 756.
Stipules present; prostrate annual.....Cypselea, p. 341.
Calyx of 5 distinct or nearly distinct sepals.....
Caryophyllaceae, p. 352.
Ovary 2 to 5-celled.
Flowers dioecious or polygamous; trees or shrubs.
Fruit a capsule; styles or stigmas as many or twice as many as ovary-cells.....Euphorbiaceae, p. 594.
Fruit a samara or drupe; leaves opposite.
Styles 2; fruit a double samara.....Acer, p. 611.
Style 1; fruit a simple samara or drupe....Oleaceae, p. 759.
Flowers perfect.
Stamens distinct; calyx inconspicuous; herbs...Aizoaceae, p. 341.
Stamens monadelphous; calyx showy; shrub...Fremontia, p. 636.
Pistils more than 1 and distinct; sepals commonly 5, sometimes 3 to 9, distinct, often petal-like; stamens 10 to many.....Ranunculaceae, p. 372.

** Calyx and corolla both wanting; pistil 1.

Flowers perfect, borne in a spike.
Spike without an involucre; herbs of woods.....ACHLYS, p. 395.
Spike subtended by a conspicuous colored involucre; herbs of saline habitat. SAURURACEAE, p. 286.

Flowers monoecious.
Terrestrial plants.
Flowers in clusters, the clusters often surrounded by a petal-like involucre resembling a perianth; stamens 1 to many; capsule 3 (or 1) -celled; juice often milky.....EUPHORBIACEAE, p. 594.
Flowers in ball-like clusters scattered on a slender axis; trees..... PLATANACEAE, p. 476.
Aquatic or palustrine plants; leaves opposite.
Leaves dissected; ovary 1-celled, in fruit a spinose or tuberculate achene.....CERATOPHYLLACEAE, p. 371.
Leaves entire; ovary 4-celled, splitting when ripe into 4 parts..... CALLITRICHACEAE, p. 602.

b. Flowers perigynous, that is, the stamens borne on the calyx or on a disk.

Flowers solitary or clustered or in heads.
Stipules present; flowers perfect.
Fruit an achene; herbs or shrubs.....ROSACEAE, p. 476.
Fruit a utricle; small herbs.....CARYOPHYLLACEAE, p. 352.
Stipules none.
Flowers perfect.
Leaves opposite; herbs.
Calyx turbinate; stamens numerous; fruit a circumscissile capsule .....SESUVIUM, p. 342.
Calyx salverform; stamens commonly 5; fruit an achene..... ABRONIA, p. 337.
Leaves alternate; calyx 4-cleft; stamens 8; fruit drupe-like; shrubs.....THYMELAEACEAE, p. 663.
Flowers dioecious; leaves opposite, silvery; shrubs..... ELAEAGNACEAE, p. 663.
Flowers in little umbels; fruit a drupe, often berry-like...RHAMNACEAE, p. 613.

2. OVARY INFERIOR, THAT IS, MORE OR LESS ADHERENT TO THE CALYX.

Flowers dioecious or the pistillate with stamens.
Stamens 8 to 12; fruit a 1-celled capsule; leaves alternate, divided..... DATISCACEAE, p. 653.
Stamens 3; fruit a berry; leaves opposite; plants parasitic on trees..... LORANTHACEAE, p. 282.

Flowers perfect or sometimes unisexual.
Leaves alternate; terrestrial plants.
Lobes of the calyx 3; ovary 6-celled; fruit a capsule; leaves cordate or reniform.....ARISTOLOCHIACEAE, p. 284.
Lobes of the calyx 4 or 5; fruit indehiscent; leaves not reniform or cordate.
Ovary 3 to 9-celled; succulent herb.....TETRAGONIA, p. 342.
Ovary 1-celled; root-parasite.....SANTALACEAE, p. 284.
Leaves opposite; aquatic or palustrine plants.
Fruit a 4-celled capsule; capsule many-seeded.....LUDWIGIA, p. 666.
Fruit consisting of 1 to 4 nutlets; nutlets 1-seeded..HALORAGEAE, p. 690.

II. **CHORIPETALOUS DIVISION.** Calyx and corolla present; petals distinct or essentially so.

A. Ovary superior, that is, free from the calyx.

1. STAMENS HYPOGYNOUS, MORE THAN 10.

a. Pistils 2 to many, simple and distinct.

Leaves simple, entire to divided, or compound; pistils becoming achenes or follicles.....RANUNCULACEAE, p. 372.
Leaves peltate; aquatic plants.....BRASENIA, p. 372.

b. Pistil 1.

Leaves alternate or basal.
Ovary 1-celled, the styles or stigmas often more than one.
Sepals caducous; petals 4 or 6, twice as many as the sepals..... PAPAVERACEAE, p. 397.

Sepals persistent or at least not caducous.
Plants with scapes and basal leaves; petals 5 to 16; sepals 2 to 8; leaves succulent.....LEWISIA, p. 350.

Plants with leafy stems.
Petals 5.
Leaves pinnately compound; calyx 4 or 5-toothed; fruit a legume.....ACACIA, p. 514.

Leaves simple, entire; calyx of distinct sepals; fruit a capsule.
Sepals 2; styles 3.....CALANDRINIA, p. 344
Sepals 5, the 2 outer smaller and bract-like; style 1.. CISTACEAE, p. 641.

Petals 1 or 2; sepals about 4; fruit a berry; leaves compound. ACTAEA, p. 374.

Ovary more than 1-celled.
Stamens distinct.
Petals 5; sepals 5; leaves basal, pitcher-shaped..... SARRACENIACEAE, p. 448.

Petals 10 to 20; sepals 5 to 12; aquatic herbs..NYMPHAEA, p. 371.
Stamens not distinct.
Ovary 5 to 30-celled; stamens numerous, united in a tube around the pistil; flowers perfect or unisexual; leaves rounded, palmately veined to palmately divided...MALVACEAE, p. 626.

Ovary 3-celled; stamens 10 to 15, united in sets of 5 in a central column; flowers unisexual; leaves rather narrow..... ARGYTHAMNIA, p. 596.

Leaves opposite, simple.
Stamens disposed in 3 to 5 indistinct bunches; fruit a capsule..... HYPERICACEAE, p. 637.

Stamens distinct; fruit capsular or separating into distinct carpels..... PAPAVERACEAE, p. 397.

2. STAMENS HYPOGYNOUS, 10 OR FEWER.

a. Pistils more than 1, distinct; flowers regular.

Pistils distinct and exceeding in number the sepals or petals; leaves mostly palmately divided or lobed . . . . . RANUNCULACEAE, p. 372.

Pistils of the same number as the sepals or petals (4 or 5), becoming follicles; leaves fleshy, entire . . . . . CRASSULACEAE, p. 449.

b. Pistil 1, the styles or stigmas 1 or sometimes more than one.

* Flowers irregular; ovary 1-celled; leaves alternate or basal.

Flowers papilionaceous; petals 5 (1 petal in Amorpha); stamens 10, united in 1 or 2 sets (distinct in several genera, 4 in Krameria, 7 in Cassia, these two with subregular corolla); leaves compound (simple in a few genera); fruit a legume, rarely indehiscent....LEGUMINOSAE, p. 510.

Flowers not papilionaceous.
Petals 5, one with a spur; sepals 5, auricled; stamens 5..VIOLACEAE, p. 642.
Petals not spurred.
Stamens 6, slightly united in two sets; leaves compound..... FUMARIACEAE, p. 404.
Stamens 3 to 40, distinct; leaves simple.....RESEDACEAE, p. 642.

** Flowers regular.

Flowers cruciferous, that is, with 4 sepals, 4 petals, 6 stamens (4 long and 2 short, rarely 4 or 2); ovary 2-celled, rarely 1-celled, sessile (except Stanleya), becoming in fruit a silique or silicle....CRUCIFERAE, p. 409.

Flowers not cruciferous.
Leaves not palmately compound.
Ovary 1-celled.
Leaves simple.
Calyx of 2 distinct sepals; stamens commonly 5; ovary 1-celled; capsule 3-valved.....PORTULACACEAE, p. 343.
Calyx not of 2 distinct sepals.
Leaves opposite.
Placenta central; stamens 5, alternate with the petals, or 10 (5 alternate, 5 opposite); rarely fewer; calyx tubular and 5-toothed, or of 5 distinct sepals; capsule 3 to 10-valved or -toothed, or the fruit 1-seeded and indehiscent.....CARYOPHYLLACEAE, p. 352.
Placenta basal but parietal; stamens 4 to 7; calyx tubular, 4 or 5-toothed; capsule 2 to 4-valved.....FRANKENIACEAE, p. 639.
Leaves alternate or basal.
Leaves basal; stamens 5, opposite the petals.
Calyx funnelform, 5-toothed; fruit an achene...
PLUMBAGINACEAE, p. 757.
Calyx saucer-shaped, 5-parted; fruit a capsule..
DROSERACEAE, p. 448.
Leaves reduced to scales, borne along the stem; sepals distinct; saprophyte in forests.....
PLEURICOSPORA, p. 740
Leaves pinnately compound.
Petals 6; stamens 6; anthers opening by uplifted valves; fruit a capsule or berry.....BERBERIDACEAE, p. 393.
Petals 5; stamens 10 or 7; anthers opening by lengthwise slits; fruit a legume.....LEGUMINOSAE, p. 510.
Ovary more than 1-celled.
Stipules none.
Flowers perfect; petals 5 or 4; leaves simple.
Stamens distinct.
Styles 2 to 5; flowers 5-merous....LINACEAE, p. 586.
Style 1; flowers 5 or 4-merous.
Leaves entire or merely toothed; fruit a capsule
ERICACEAE, p. 735.
Leaves dissected; fruit separating into 5 subglobose carpels. LIMNANTHACEAE, p. 592.
Stamens united in a tube, 5 perfect stamens alternating with 5 staminodia at summit of tube.....
AYENIA, p. 637.
Flowers unisexual or polygamous; stamens 2 to 4; trees or shrubs.
Ovary 2-celled; petals 2; leaves opposite, pinnate; fruit a samara.....OLEACEAE, p. 759.
Ovary 6 to 9-celled; petals mostly 3; leaves alternate, simple; fruit a drupe.....EMPETRACEAE, p. 752.
Stipules present; leaves opposite, at least the lower.
Fruit a 2 to 5-celled capsule; stamens 2 to 5; leaves simple..
ELATINACEAE, p. 638.
Fruit splitting into 5 carpels or nutlets; stamens 10 (sometimes only 5 with anthers); petals 5; sepals 5.
Styles 5, united around an elongated axis, free only at tip; carpels separating elastically when ripe, tailed by the persistent coiled styles; leaves or leaflets parted, cleft or toothed...GERANIACEAE, p. 589.
Style 1; carpels not tailed; leaves pinnate, the leaflets entire.....ZYGOPHYLLACEAE, p. 603.

Leaves palmately compound with 3 to 5 leaflets.
Calyx with less than 6 sepals.
Sepals 5; petals 5; stamens 10, more or less united at base; ovary 5-celled, sessile.....OXALIDACEAE, p. 587.
Sepals 4; petals 4; stamens 6, distinct; ovary raised on a stipe, 1 or 2-celled.....CAPPARIDACEAE, p. 406.
Calyx with 6 sepals in 2 series; stamens 6.....VANCOUVERIA, p. 395.

3. STAMENS PERIGYNOUS, THAT IS, ON THE CALYX OR ON A MORE OR LESS EVIDENT DISK; COROLLA REGULAR.

a. Stamens borne on a hypogynous disk or on a disk lining the base of the calyx; trees or shrubs.

Fruit a double samara; stamens 3 to 10; leaves opposite, simple.....
ACERACEAE, p. 611.
Fruit not a double samara.
Leaves palmately compound, opposite, the leaflets 5 to 7; stamens 4 to 9; petals clawed, slightly irregular; fruit a 1-seeded dehiscent pod..
SAPINDACEAE, p. 612.
Leaves simple, pinnately compound or 3-foliolate.
Stamens numerous (15 to 50); pistils 2 to 9, distinct; petals 5; seeds with a fimbriate aril.....CROSSOSOMATACEAE, p. 475.
Stamens 4 to 10.
Stamens as many as the petals and alternate with them, or twice as many.
Leaves with minute stipules or mostly so.
Style 1 or none; fruit a capsule or follicle; seeds with an aril; leaves alternate or opposite.....
CELASTRACEAE, p. 609.
Styles 3; fruit a bladdery pod; seeds not arillate; leaves opposite, pinnate.....STAPHYLEACEAE, p. 610.
Leaves without stipules.
Style 1.
Leaves glandular-dotted or aromatic, simple or 3-foliolate.....RUTACEAE, p. 604.
Leaves not glandular-dotted, alternate.
Disk 10-lobed; leaves pinnate or reduced to scales.....SIMARUBACEAE, p. 606.
Disk not lobed.
Leaves pinnate; seeds not winged.....
BURSERACEAE, p. 607.
Leaves simple, scale-like; seeds winged....
KOEBERLINIACEAE, p. 609.
Styles 3 to 5; leaves alternate.
Leaves broad; herbage with resinous or acrid juice..
ANACARDIACEAE, p. 607.
Leaves minute, appressed; juice not acrid.....
TAMARICACEAE, p. 640.
Stamens as many as the petals and opposite them; leaves simple, alternate (opposite in Adolphia).
Shrubs; petals commonly hooded; fruit 3 (or 2) -celled, dry, splitting into 3 (or 2) one-seeded parts, or drupaceous.....RHAMNACEAE, p. 613.
Woody climbing vine; petals not hooded, caducous; fruit a berry.....VITACEAE, p. 625.

b. Stamens borne on the calyx.

Stipules present (except Holodiscus and Aruncus and sometimes in Osmaronia); pistils one to several, sometimes partly united to the disk; petals 5; stamens 10 to numerous; leaves alternate, simple or compound (opposite in Lyonothamnus and Coleogyne).....ROSACEAE, p. 476.

Stipules none; leaves simple.
Pistils many, concealed in a hollow receptacle; petals many; stamens numerous; leaves opposite; shrubs.....CALYCANTHACEAE, p. 393.
Pistil 1; stamens 3 to 10 or numerous.
Styles or stigmas more than 1; petals commonly 5 (4 to 8).....SAXIFRAGACEAE, p. 454.
Style and stigma 1; capsule enclosed by but free from the calyx.....LYTHRACEAE, p. 664.

B. Ovary inferior, that is, more or less adherent to the calyx.

1. TREES OR SHRUBS.

Stamens more numerous than the petals; petals 5.
Leaves alternate; fruit a pome.....ROSACEAE, p. 476.
Leaves opposite; fruit a capsule.....WHIPPLEA, p. 466.
Stamens as many as the petals and opposite them; petals 5, hooded; capsule 3-celled, 1 seed in each cell; shrubs or small trees....CEANOTHUS, p. 615.
Stamens as many as the petals and alternate with them.
Style 1; petals 4; stamens 4; flowers small, in cymes, or if in a head, surrounded by a conspicuous corolla-like involucre; fruit drupe-like; leaves opposite.....CORNACEAE, p. 732.
Styles 2, more or less distinct; petals 5 (or 4); stamens 5 (or 4); flowers in racemes or solitary; fruit a smooth or prickly berry; leaves alternate, commonly with stipules.....RIBES, p. 467.

2. HERBS.

Petals 5 or fewer.
Flowers in umbels; stamens 5.
Umbels compound, often simple, sometimes capitate; petals inflexed at tip; styles 2; fruit splitting into 2 one-seeded carpels.....UMBELLIFERAE, p. 691.
Umbels simple, panicled; petals not inflexed at tip; styles 5; fruit berry-like.....ARALIACEAE, p. 691.
Flowers not in umbels.
Styles or stigmas 2 to 5; calyx 5-lobed; petals 5; stamens 5 or 10; fruit a 1 to 5-celled capsule.....SAXIFRAGACEAE, p. 454.
Style 1.
Sepals and petals 4 (rarely 5 or 2), the stamens commonly twice as many; fruit commonly a 4-celled capsule.....ONAGRACEAE, p. 665.
Sepals and petals 5; stamens numerous; fruit a 1-celled capsule opening at the top; rough-hairy herbs, sometimes small bushes.....LOASACEAE, p. 648.
Sepals 2; petals 4; stamens 7 to 20; style mostly 3 to 8-parted; fleshy herb.....PORTULACA, p. 352.
Style none; stigmas 4; leaves in whorls; aquatic plants.....HALORAGEAE, p. 690.
Petals and stamens numerous; fruit 5 to 12-celled, dehiscing at summit; succulent maritime herbs.....MESEMBRYANTHEMUM, p. 342.

III. **SYMPETALOUS DIVISION.** Calyx and corolla both present, the corolla with the petals united, at least at base.

A. Stamens more than 5.

1. COROLLA URNSHAPED TO TUBULAR OR CAMPANULATE, OR AT LEAST MARKEDLY SYMPETALOUS.

Stamens free from corolla or only lightly adherent at base.
Style 1, stigma 1; ovary 4 to 10 (rarely 1, 2 or 3)-celled; anthers commonly opening by a terminal pore, sometimes slit lengthwise; (Rhododendron occidentale has 5 stamens).....ERICACEAE, p. 735.

Styles 3, united to middle; ovary incompletely 3-celled; thorny desert shrub. FOUQUIERIACEAE, p. 640.
Stamens inserted in throat of tubular corolla; root parasite; (stamens 5 to 7). LENNOACEAE, p. 734.

2. COROLLA NEVER TUBULAR OR URNSHAPED, COMMONLY WITH THE PETALS JOINED ONLY AT BASE.

a. Ovary superior.

Pistils 4 or 5, distinct; stamens 10 ..... CRASSULACEAE, p. 449.
Pistil 1.
Corolla irregular; style 1, entire.
Flowers papilionaceous.
Ovary 1-celled; petals 5; fruit a legume; leaves compound, sometimes simple ..... LEGUMINOSAE, p. 510.
Ovary 2-celled; petals 3; fruit a capsule; leaves simple, entire... POLYGALACEAE, p. 593.
Flowers with the 4 petals in two dissimilar pairs; sepals 2; stamens 6; leaves divided ..... FUMARIACEAE, p. 404
Corolla regular.
Stamens 10, united at very base; ovary 5-celled; style 5-lobed; leaves 3-foliolate ..... OXALIDACEAE, p. 587.
Stamens numerous, monadelphous in a tube; ovary 5 to many-celled; leaves simple, roundish, subentire to palmately divided..... MALVACEAE, p. 626.

b. Ovary inferior or slightly inferior.

Petals and stamens numerous; succulent very spiny plants... CACTACEAE, p. 654
Petals 4 to 8, the stamens about twice as many; shrubs... STYRACACEAE, p. 758.

B. Stamens 5 or less, inserted on the corolla.

1. OVARY SUPERIOR, THAT IS, FREE FROM THE CALYX.

a. Corolla regular.

Pistil 1.
Stamens as many as the lobes of the corolla and opposite them; style 1; fruit a capsule; (stamens 5 to 7 in Trientalis)..... PRIMULACEAE, p. 753.
Stamens as many as or fewer than the lobes of the corolla and alternate with them.
Corolla colored, not dry-scarious.
Ovary 1, 2 or 3-celled.
Fruit a capsule (sometimes a berry), not opening by a lid.
Style 3-cleft; ovary 3-celled, the flower otherwise with the parts in 5s; capsule 3-valved..... POLEMONIACEAE, p. 781.
Style not 3-cleft; ovary 1 or 2-celled.
Calyx of 5 distinct sepals, or the sepals united only below; corolla 5-lobed; stamens 5; capsule commonly 2-valved.
Erect or diffuse plants; corolla-lobes commonly imbricate in the bud; flowers in coiled racemes or spikes or in heads or solitary; corolla-tube often with internal scales; styles 2 and distinct, or 1 and more or less cleft at apex; capsule few to many-seeded; (style 1 and entire in Romanzoffia) ..... HYDROPHYLLACEAE, p. 809.
Twining or trailing plants; corolla mostly plaited, the plaits twisted in the bud; flowers not in coiled inflorescences;

corolla-scales none except in Cuscuta; styles 1 or 2; capsule 1 to 4-seeded.... CONVOLVULACEAE, p. 775.

Calyx 4 or 5-toothed or cleft; style 1, entire.

Ovary 2-celled; corolla 5-lobed; stamens 5; fruit a many-seeded capsule or berry; stigma 1 (2 in Datura); leaves alternate..... SOLANACEAE, p. 886.

Ovary 1-celled; corolla 4 or 5-lobed, commonly withering-persistent; stamens 4 or 5; stigmas 2; fruit a septicidal capsule; leaves opposite..GENTIANACEAE, p. 761.

Fruit a circumscissile capsule; stamens 2; shrubs..... MENODORA, p. 760.

Ovary 4-celled, commonly 4-lobed, splitting when ripe into as many nutlets; stamens 5; style 1; flowers in coiled spikes or racemes.....BORAGINACEAE, p. 835.

Corolla dry-scarious; capsule opening by a lid; ovary 2 or 4-celled; stamens 2 to 4; style 1.....PLANTAGINACEAE, p. 954.

Pistils 2 (the ovaries distinct but the styles or stigmas united); herbs with milky juice.

Stamens and stigmas united, the column bearing hood-like appendages.... ASCLEPIADACEAE, p. 769.

Stamens and stigmas not united; no hoods.....APOCYNACEAE, p. 768.

b. Corolla from strongly 2-lipped to slightly irregular.

Stamens 4 or 2.

Fruit a capsule.

Ovary 1-celled.

Stamens 2; corolla spurred; aquatic plants with finely divided leaves, some bearing bladders..LENTIBULARIACEAE, p. 950.

Stamens 4.

Corolla gibbous; capsule very large, its beak splitting into 2 diverging spines; terrestrial trailing plants..... MARTYNIACEAE, p. 950.

Corolla not gibbous; capsule small, not beaked; root-parasites without green foliage.....OROBANCHACEAE, p. 951.

Ovary 2-celled.

Placentae axile; seeds not winged.

Herbs, rarely shrubs; corolla strongly 2-lipped to nearly regular; stamens 4 or 2, a fifth rarely present as a sterile filament or rudiment (or stamens 5 in Verbascum); leaves alternate or opposite..... SCROPHULARIACEAE, p. 895.

Shrubs; stamens 2; calyx with a pair of opposite bractlets at base.....ACANTHACEAE, p. 954.

Placentae parietal; seeds winged; shrubs...BIGNONIACEAE, p. 949.

Fruit of 2 to 4 nutlets; leaves opposite.

Ovary not lobed, 2 to 4-celled, splitting into as many nutlets; stamens 4; style 1, entire.....VERBENACEAE, p. 857.

Ovary 4-lobed, splitting into as many nutlets; stamens 4 or 2; style 1, cleft at apex; stems square; herbage with the odor of mint.. LABIATAE, p. 860.

Stamens 5, some or all woolly.....VERBASCUM, p. 896.

2. OVARY INFERIOR, THAT IS, ADHERENT TO THE CALYX-TUBE.

1. Stamens distinct.

Leaves alternate; flowers regular; stamens 5; ovary and capsule 2 to 5-celled; herbs.....CAMPANULACEAE, p. 971.

Leaves opposite or whorled.

Stamens 1 to 3; flowers irregular; fruit 1-celled, 1-seeded; herbs..... VALERIANACEAE, p. 970

Stamens 4 or 5, rarely 2.
Ovary 1-celled; flowers in involucrate heads or short spikes; fruit an achene; herbs.....DIPSACEAE, p. 969.
Ovary more than 1-celled (except in Viburnum).
Ovary in ours 2-celled; flowers regular; fruit berry-like or dry, commonly separating into 2 one-seeded achene-like portions; leaves simple; herbs or shrubs.....RUBIACEAE, p. 957.
Ovary 2 to 5-celled; flowers regular or irregular; fruit a berry, drupe or pod; leaves simple or compound; erect or twining shrubs.
CAPRIFOLIACEAE, p. 964.

2. Stamens united into a tube around the style.

Flowers not in heads.
Stamens 3; leaves commonly palmate; tendril-bearing herbs.....
CUCURBITACEAE, p. 660.
Stamens 5; leaves narrow; annual herbs.....LOBELIACEAE, p. 974.
Flowers collected into a head furnished with a calyx-like involucre, the whole resembling a single flower; stamens 5, rarely 4; fruit an achene.....
COMPOSITAE, p. 979.

ABBREVIATIONS

acc., according to.
carp., carpel.
cent., central.
co., county; *cos.*, counties.
e., easterly, eastward, east.
fl., flower, flowering.
fr., fruit, fruiting.
ft., foot or feet.
in., inch or inches.
involuc., involucre.
isl., island.
line, $\frac{1}{12}$ of an inch, 2 millimeters.
long., longitudinal.
mt., mount, mountain.
n., northerly, northward, north.
n. comb., new combination.
n. sp., new species.
n. var., new variety.
nat. from, naturalized from.
nat. of., native of.
no., number.
pist., pistillate.
s., southerly, southward, south.
sect., section.
stam., staminate.
subsp., subspecies.
var., variety.
w., westerly, westward, west.

Subkingdom **PTERIDÓPHYTA.** Fern Plants

Ours herbs. Sporophyte (or leafy plant) reproducing by means of non-sexual cells or spores borne in sporangia. Spores giving rise to flat plates of tissue or prothallia (gametophyte), these bearing male organs (antheridia) and female organs (archegonia). Archegonia containing an oosphere, this fertilized in the presence of water by a self-motile sperm released from an antheridium, the fertilized cell developing in turn a leafy plant or sporophyte.

ÒPHIOGLOSSÀCEAE. Adder's-tongue Family

Stem reduced to a short subterranean vertical rootstock, producing one leaf every year. Vernation straight or inclined. Leaf divided into 2 parts, the foliage part (here simply called the leaf) and the spore-bearing part or spike (sporophyll). The spore-bearing spike faces the foliage part, both being branches of the same stalk or petiole. Sporangia large, globose, borne laterally, opening transversely by a slit.

Leaf simple, entire; sporangia borne in an unbranched spike.....1. Ophioglossum.
Leaf pinnate; sporangia borne in a branched spike or panicle.....2. Botrychium.

1. ÒPHIOGLÓSSUM L. Adder's Tongue

Rootstock short. Leaf ovate to lanceolate, reticulately veined. Spike flattened, bearing its sporangia in 2 rows. (Greek ophis, snake, and glossa, tongue.)

Leaf ovate to elliptic; basal veins 9 to 13 or more.....1. *O. vulgatum.*
Leaf lanceolate; basal veins 3 to 7.....2. *O. californicum.*

1. **O. vulgàtum** L. Plants 4 to 10 in. high; leaf ovate to elliptic, sometimes oblanceolate, rounded at apex, 1 to 4 in. long, sessile near the middle of the plant; midvein indistinct or none; principal veins forming a loose network, the meshes nearly free from secondary veins; spike ¾ to 2 in. long, long-stalked, exceeding the leaf.—Siskiyou Co.; e. to the Atlantic.

2. **O. califórnicum** Prantl. Plants 1 to 3 in. high; leaf lanceolate to ovate, acute or obtuse, ½ to 1 in. long; basal veins 3 to 7, the middle one stronger, the lateral branched; transverse veinlets oblique, forming long narrow areolae with few or no free veinlets; spike 3 to 6 lines long, with about 15 sporangia on either side.—Ione, Amador Co.; San Diego.

2. BOTRÝCHIUM Sw. Moonwort

Rootstock small, tuberous. Leaf uni- to quadri-pinnate, fan-veined. Spike pinnately branched, covered on the surface facing the blade with small coriaceous sporangia. (Greek botrus, a cluster, referring to the sori.)

Leaf arising from above the middle of the plant.....1. *B. lunaria.*
Leaf arising from near the base of the plant.
  Leaf pinnate.....2. *B. simplex.*
  Leaf ternately decompound.....3. *B. silaifolium.*

1. **B. lunària** (L.) Swz. Plants fleshy, 6 to 9 (2½ to 12) in. high; leaf usually sessile, borne at or above the middle of the plant, pinnate with 2 to 8 pairs of lobes; lobes lunate or fan-shaped, crenate or entire, closely imbricated or somewhat distant; sporophyll bi- or tri-pinnate, 1 to 2 in. long, often exceeding the leaf.—Lytle Creek, San Antonio Mts., 7000 ft.; Whitehorse Lake, Modoc Co., about 5000 ft.; e. to Vt.

2. **B. símplex** E. Hitchc. Plants slender, 2 to 5 in. high; leaf borne near the base of the plant, ovate in outline, ½ to 1¼ in. long, pinnately parted (or sometimes ternate with pinnate divisions); segments obovate, obtuse, crenulate or lobed, 3 to 5 lines long; sporophyll a simple or slightly compound spike, sometimes reduced to a few sporangia; spores large, minutely tuberculate.—San Bernardino Mts.; Sierra Nevada from Tulare Co. to Tuolumne Co.; Siskiyou Co.; e. to Nova Scotia.

3. **B. silaifòlium** Presl. var. **californicum** (Underw.) Jepson n. comb. CALIFORNIA GRAPE-FERN. Plants stout, 8 to 18 in. high, the common stalk very short, wholly underground; leaves solitary or sometimes 2, broadly triangular or somewhat 5-sided in outline, the 3 main divisions copiously tri-pinnatifid or even quadri-pinnatifid, thick and fleshy, coriaceous in drying, glaucous, 4 to 10 (or 14) in. broad, nearly as long; ultimate segments numerous, ovate or obliquely oval, crenulate, 2 to 3 lines long; leaf-stalk 1 to 4 (or 6) in. long; sporophyll 2 to 5-pinnate, long-stalked, stout, 6 to 10 in. long.—Sierra Nevada from Mariposa Co. to Plumas and Modoc Cos., thence westerly to Humboldt Co. Var. COÚLTERI (Underw.) Jepson n. comb. Similar; leaf-stalk ½ to 1 in. long; ultimate segments crowded.—In hot springs, Kings Valley, Lassen Peak.

POLYPODIÀCEAE. FERN FAMILY

Ours herbs. Leaf-blades (fronds) commonly much lobed or divided, borne on petioles (stalks) arising from creeping rootstocks; vernation circinate. Sporangia borne in clusters (sori) on the backs or margins of the leaves, and provided with a vertical incomplete thickened ring or annulus, dehiscing by a transverse cleft. Sori occurring as dots or collected in lines, commonly covered by a membrane or scale (indusium) derived from the margin or surface of the frond.

Indusium none or obscure, the sori naked.
- Leaves powdery or waxy or tomentose beneath; leaves uni- to quadri-pinnate.
  - Sori elongated, following the veins, often branched or netted..1. GYMNOGRAMME.
  - Sori roundish or oblong, marginal.....2. NOTHOLAENA.
- Leaves not powdery or waxy or tomentose; sori round or dot-like.
  - Leaves simply pinnatifid; sori large, on the tips of the veins....3. POLYPODIUM.
  - Leaves thrice pinnatifid; sori small, on the backs of the veins...4. PHEGOPTERIS.

Indusium present.
- Sori marginal or submarginal, covered by the more or less modified margin of the leaf or indusium.
  - Sori clearly distinct.....5. ADIANTUM.
  - Sori in a more or less continuous marginal band.
    - Leaf stalks stout, commonly solitary.....6. PTERIS.
    - Leaf stalks slender, clustered.
      - Fronds hairy, scaly or viscid (except 1 species).....7. CHEILANTHES.
      - Fronds glabrous.
        - Sterile and fertile fronds much alike; leaf-stalk dark-colored.... 8. PELLAEA.
        - Sterile and fertile fronds very unlike; leaf-stalks light brown or cinnamon.
          - Fronds bi- or tri-pinnate.....9. CRYPTOGRAMMA.
          - Fronds simply pinnate.....10. LOMARIA.

Sori not marginal.
- Fruit-bearing veins parallel to the midrib; sori linear, nearer the midrib than the margin; leaves pinnately compound, all alike....11. WOODWARDIA.
- Fruit-bearing veins not parallel to the midrib.
  - Sori oblong, seated on oblique veins.
    - Sori straight; leaves evergreen.....12. ASPLENIUM.
    - Sori curved; leaves herbaceous.....13. ATHYRIUM.
  - Sori round.
    - Indusium conspicuous.
      - Indusium peltate; leaves firm or coriaceous....14. POLYSTICHUM.
      - Indusium reniform; leaves membranaceous.....15. ASPIDIUM.
    - Indusium inconspicuous.
      - Indusium placed beneath the sorus, irregularly lobed or fringed.. 16. WOODSIA.
      - Indusium attached at the side, hooded.....17. CYSTOPTERIS.

1. GYMNOGRÁMME Desv.

Densely tufted fern. Leaves in ours pinnate, white or golden beneath with a waxy powder. Sori oblong or linear, simple, forked or pinnate, following the course of the veinlets. Indusium none. (Greek gumnos, naked, and gramme, line, the indusium lacking.)

1. **G. triangulàris** Kaulf. GOLD FERN. Fig. 1. Five to 10 in. high; stalks dark brown, polished; fronds pentagonal or deltoid in outline, partly or twice pinnate, 2 to 4 (or 5) in. long; lower pair of pinnae the larger, pinnate; pinnules oblong, nearly entire to pinnately lobed; sori more or less confluent and largely covering the backs of the pinnae.—Damp rock crevices or moist places, 100 to 4500 feet: Coast Ranges; Sierra Nevada; cismontane S. Cal.;

desert ranges; n. to B. C., e. to Ariz. (Ceropteris triangularis Underw.). Var. VISCÒSA Eat. Upper surface of leaves viscid.—San Diego Co.

1. Gymnogramme triangularis Kaulf.; frond x ½.

2. NOTHOLAÈNA R. Br.

Ours small ferns. Leaves small, uni- to quadripinnate, hairy, tomentose or white-waxy beneath. Sori seated on the veins at or near their extremities, roundish or oblong, soon more or less confluent into an irregular marginal band. Indusium none. Veins always free. (Greek nothos, spurious, and laina, cloak, the woolly hairs forming a false indusial covering to the sorus.)

Fronds simply pinnate.....1. *N. sinuata.*
Fronds bipinnate to quadripinnate.
  Fronds woolly, especially beneath.
    Segments of the fronds with a close felt; stalks commonly with intermixed hairs and shorter gland-tipped hairs, sometimes glabrate; scales of rootstock subulate; cismontane S. Cal.....2. *N. newberryi.*
    Segments of fronds coarsely and thickly woolly; stalks woolly or at length more or less glabrate; scales of rootstock lanceolate; deserts...3. *N. parryi.*
  Fronds glabrous or nearly so.
    Pinnules sessile; fronds colored beneath; basal lower pinnules of lowest pair of pinnae much elongated and again pinnatifid.
      Fronds bright yellow or white beneath, the segments without inturned margin or scarcely.....4. *N. candida.*
      Fronds brown or dull white beneath, the segments with strongly incurved margin .....5. *N. californica.*
    Pinnules stalked; fronds green; lowest pinnules not elongated.....6. *N. jonesii.*

2. Notholaena newberryi Eat.; frond x ½, the pinnules hidden by the tomentum.

1. **N. sinuàta** (Swz.) Kaulf. Plants rigidly erect, 8 to 14 in. high; stalks short, arising from a densely red-scaly rootstock; fronds simply pinnate, the lower surface densely scaly; pinnae numerous, ovate or roundish, 3 to 8 lines long.—Providence Mts.; e. to Tex., s. to Mex.

2. **N. newbérryi** Eat. COTTON FERN. Fig. 2. Plants 3 to 8 in. high, densely felt-like, or white-tomentose or silvery, at length rusty on the lower surface of the fronds; rootstocks densely clothed with dark-brown subulate scales; fronds lanceolate-oblong, tri- or quadri-pinnate, 3 to 4 in. long, as long as the stalks; pinnae oblong-ovate or sometimes narrowly triangular-ovate, mostly (4 or) 6 to 12 lines long, the lower 1 to 3 pairs discrete or distant; pinnules crowded, their segments minute (about ½ line long), roundish-ovate; hidden by the tomentum; sporangia rather large, blackish, at length emergent from the tomentum.—Among stones or under boulders, very dry places, San Bernardino Mts. to San Diego Co. and L. Cal.

3. Notholaena parryi Eat.; frond x ½, the pinnules hidden by the wool.

3. **N. párryi** Eat. PARRY CLOAK FERN. Fig. 3. Plants 2½ to 8 in. high, the tomentum similar to but coarser than in no. 1; rootstocks short, densely clothed with red-brown lanceolate scales which often have a black midnerve; fronds oblong-lanceolate (¾ or) 1½ to 4 in. long, about as long as the stalks, tripinnate, the lower pinnae distant; pinnae 2 to 4 or 5 lines long, commonly so densely tomentose as to look like pellets of wool; ultimate segments oblong-ovate, 1 line long; sporangia blackish, eventually projecting beyond the margin of the segments.—Crevices of cliffs and under boulders: Death Valley; e. Mohave Desert; Colorado Desert; L. Cal., e. to Ariz. and Utah.

4. **N. cándida** Hook. var. **accéssita** Jepson n. var. PIGMY FERN. Plants 2 to 4 in. high; scales of the rootstock nearly

black; fronds roundish-cordate or triangular-ovate, pinnate, ¾ to 1 in. long, covered beneath with a white or yellow waxy powder; pinnae oblong-lanceolate from a broad base, obtuse, pinnatifid; pair of lowest pinnules with the basal segment on the lower side greatly elongated and pinnatifid, resembling a supplementary pinnule; lower basal segment greatly elongated and again pinnatifid, the other pairs regularly segmented and gradually decreasing upward; segments elliptic, obtuse.—San Diego Co.: upper Vallecito (Jepson 8031, type); Spring Valley.

5. **N. califórnica** Eat. Stalks tufted, 1¾ to 5½ in. high, glabrous; fronds ¾ to 1¾ in. long, similar to no. 3, but brownish or dull white beneath, segments with strongly incurved margins.—S. Cal. (Deadman Pt., Victorville; San Bernardino; Palm Sprs., Mt. San Jacinto); s. to L. Cal., e. to Ariz.

6. **N. jònesii** Max. Tufted, 1½ to 3¾ in. high; fronds oblong-ovate, bipinnate, glabrous; pinnae few; pinnules 1 or 2 pairs, mostly short-stalked, distant, roundish or subcordate, entire or crenate, 1 to 2 (or 2¼) lines long, the terminal segment similar but often larger; sori in a broad submarginal band.—Desert ranges: San Bernardino Mts. (n. slope); Panamint Mts.; e. to Utah. (N. tenera Am. auth.)

4. Polypodium vulgare var. occidentale Hook.; frond x ¼.

3. **POLYPÒDIUM** L. Polypody

Ours small ferns with creeping scaly rootstocks and glabrous herbage. Leaves not tufted, pinnately parted. Sori roundish, arranged in a row either side of the midvein. Indusium none. (Greek polus, many, and pous, foot, the stipes many in some.)

Sori ½ to 1½ lines broad; frond mostly membranous; terminal pinna usually not conspicuous.
Pinnae acuminate, often somewhat falcate; var. occidentale of.....1. *P. vulgare.*
Pinnae acute, not falcate (or obtuse).
Veins forming areolae, with an included veinlet bearing a sorus; lower altitudes, common; var. intermedium of.....1. *P. vulgare.*
Veins not forming areolae, free; high montane, rare.....2. *P. virginianum.*
Sori 1½ to 2 lines broad; fronds coriaceous; terminal pinna conspicuous..3. *P. scouleri.*

1. **P. vulgàre** L. var. **occidentàle** Hook. Licorice Fern. Fig. 4. Stalk slender, 2 to 5½ in. long; fronds thin-membranous, 6 to 11 in. long, pinnatifid almost to the midrib; pinnae lanceolate or oblong-lanceolate, often somewhat curved, tapering to an acuminate point, 1 to 2½ in. long; sori about ⅔ line broad, distinct.—On trees or in moist soil in the Redwood belt of Humboldt Co.; n. to Wash. Apparently also in Marin Co. Roots roasted as a confection. (P. occidentale Max.) Var. intermèdium (H. & A.) Fer. California Polypody. Stalks somewhat slender, 2 to 4 in. long; fronds ovate or ovate-oblong, pinnatifid almost to the midrib, 3½ to 10 (or 14) in. long; pinnae oblong, tapering to an acute apex, serrulate, 1½ to 3 in. long; sori 1 to 1½ lines broad, distinct or confluent.—Mossy banks, crevices of rocks, rarely on trees: Sierra Nevada foothills from Butte Co. to Fresno Co. (1500 to 4000 ft.); near the coast from Humboldt Co. to San Luis Obispo Co. (50 to 1500 ft.); coastal Mts. of S. Cal. (100 to 4000 ft.). Var. kaulfùssii (Eat.) Fer. Plants smaller (3 to 5 or 7 in. high); pinnae mostly obtuse.—Headland slopes facing the sea, Marin Co., San Francisco and s.

5. Polypodium scouleri H. & G.; frond x ¼.

2. **P. virginiànum** L. Golden Polypody. Similar to no. 1; plants 8 to 14 in. high; fronds subcoriaceous; lowest pairs of pinnae more frequently alternate than

in no. 1.—High montane, 5000 to 8000 ft., rare: Yosemite; San Bernardino Mts.; e. to the Atlantic.

3. **P. scoùleri** H. & G. LEATHER-LEAF. Fig. 5. Fronds ovate, coriaceous, 4 to 10 in. long, parted to the midrib; stalks stout, 4 to 6 in. high; pinnae oblong, rounded at apex, obscurely serrulate, 1½ to 2½ in. long, the terminal pinna distinct, much longer than the upper lateral ones, often the largest of all; sori roundish, 1½ to 2 lines broad, distinct or eventually more or less confluent.—On trees or rocks: Redwood belt from San Mateo Co. to Del Norte Co.; Santa Barbara Isls.; n. to B. C.

6. Phegopteris alpestris var. americana Jepson; pinna x 1.

4. PHEGÓPTERIS Fee. BEECH FERN

Rather large ferns. Fronds nearly tripinnate in ours. Sori round, minute, seated on the veins below their apex; indusium none. (Greek phegos, a kind of oak with edible nut, and pteris, fern.)

1. **P. alpéstris** Hoppe var. **americàna** (Butters) Jepson n. comb. ALPINE BEECH FERN. Fig. 6. Plants ⅔ or 1½ to 2½ ft. high; fronds oblong-lanceolate, glabrous (6 or) 10 to 20 in. long; pinnae narrowly deltoid-lanceolate, the pinnules oblong-lanceolate, pinnatifid with the segments toothed.—High montane, 7000 to 11,500 ft.: Sierra Nevada from Tulare Co. to Tuolumne and Lassen Cos.; thence nw. to Siskiyou Co.; White Mts. of Inyo Co.; n. to B. C.; Eur.

5. ADIÁNTUM L.

Delicate ferns with creeping rootstocks. Leaf stalks blackened or purplish brown, commonly highly polished. Pinnules more or less one-sided. Sori borne on the ends of the veinlets at the edge of the pinnules and covered by a reflexed margin or indusium. (Greek a, not, diaino, to wet, the foliage shedding rain.)

Leaf stalks continuous, bearing pinnae along their axes.
Upper margin of fertile pinnules more or less palmately incised or serrulate . . . . . 1. *A. capillus-veneris*
Upper margin of fertile pinnules rounded, entire save for 1 to 3 very short clefts . . 2. *A. emarginatum*
Leaf stalks forked at the summit, each curving fork bearing several pinnae . 3. *A. pedatum*.

7. Adiantum capillus-veneris L.; pinna x ½.

1. **A. capíllus-véneris** L. COMMON MAIDEN-HAIR. Fig. 7. Leaves ⅓ to 1½ (or 2) ft. high; stalks and rachises black, polished; pinnae with about 3 to 10 pinnules; pinnules obovate or roundish, cuneate and entire at base, palmately cleft or serrulate above, 3 to 6 (or 11) lines long; indusia marginal, transversely oblong, separated.—Moist cool and shady cañon walls at low altitudes, widely scattered in the state but relatively rare; cosmop.

2. **A. emarginàtum** Hook. CALIFORNIA MAIDEN-HAIR. Fig. 8. Similar to no. 1; stalks stouter; pinnules broadly fan-shaped, reniform to cuneate at the entire base, above serrulate in the sterile pinnules, or with only 1 to 3 very short clefts in the fertile pinnules, 6 to 8 (or 13) lines broad; indusia marginal, transversely elongated, only slightly interrupted around the whole upper portion of the pinnule.—Moist places at low altitudes: cismontane S. Cal.; Coast Ranges; rare in the Sierra foothills (American River).

8. Adiantum emarginatum Hook.; pinna x ½.

3. **A. pedàtum** L. FIVE-FINGER FERN. Fig. 9. Leaves 1 to 2½ ft. high, the stalks forked at the top, the outwardly curving forks each bearing 3 to 8 pinnae; pinnae long-oblong, 3 to 9 in. long; pinnules oblong, incised on the upper margin, entire below, short-stalked; indusia long-oblong.—Moist cool

9. Adiantum pedatum L.; pinna x ½.

places throughout the state; N. Am., Asia. Var. ALEÙTICUM Rupr. Pinnae fewer and more strict; pinnules longer-stalked, more deeply cleft.—Rare, high Sierra Nevada, 7000 to 10,000 ft.; n. to Alas.

6. PTÈRIS L. Bracken

Ferns with usually solitary stalks and dark cord-like rootstocks creeping widely underground. Leaves ample, once to thrice pinnate or decompound. Sori marginal, continuous, borne on a marginal vein which connects the ends of the lateral veins. Indusium continuous around the margins of the segments or sometimes interrupted at their apices. (Greek pteris, a wing, the name applied to ferns on account of the feathery fronds.)

1. **P. aquilìna** L. var. **lanùginòsa** (Bory) Hook. Fig. 10. Plants 1 to 4 ft. high; fronds ternate at the summit of an erect stout stalk, then twice pinnate, tomentulose beneath; pinnules oblong-lanceolate, the upper undivided, the lower more or less pinnatifid.—Common throughout the state in the foothills, ascending in the mountains to the Yellow Pine belt. The young shoots were eaten by the native tribes and the fronds are used by white settlers for thatching summer shelters. (Pteridium aquilinum (L.) Kuhn var. lanuginosum.)

10. Pteris aquilina L. var. lanuginosa Hook.; pinna x 1.

7. CHEILÁNTHES Sw. Lip Fern

Low ferns with bi- or tri-pinnate leaves. Sterile and fertile leaves nearly alike. Sori roundish, distinct or nearly contiguous, seated on the thickened ends of the free veinlets, covered by a mostly whitish and membranous common indusium derived from the reflexed margins of the pinnule or of its lobes. (Greek cheilos, margin, and anthus, flower, the sori marginal.)

Upper divisions of the rachis with a narrow herbaceous border; herbage glabrous, not viscid or scaly; fronds deltoid; indusia distinct.....1. *C. californica.*
Rachis without an herbaceous border; herbage viscid or woolly or scaly; fronds lanceolate or linear to ovate.
Ultimate segments flattish; indusium not continuous all around the margin.
Herbage viscid, not hairy or only obscurely so.....2. *C. viscida.*
Herbage hairy and more or less glandular.....3. *C. cooperae.*
Ultimate segments bead-like; indusium continuous all around the margin of the pinnule; fronds bi- to quadri-pinnate.
Fronds tomentose beneath, not scaly.
Stipes and rachises not scaly.
Upper surface of fronds naked or nearly so; indusium prominent, continuous, not concealed.....4. *C. gracillima.*
Upper surface of fronds with long scattered hairs or glabrate; indusium slightly interrupted, concealed by the dense tomentum of the under surface.....5. *C. feei.*
Stipes and rachises covered with very narrow scales; upper surface of fronds decidedly pubescent; local about Mt. San Jacinto.
Rachises coarsely fibrous beneath.....6. *C. fibrillosa.*
Rachises not fibrous beneath.....7. *C. parishii.*
Fronds densely imbricated beneath with membranous lanceolate scales, not at all tomentose.
Leaves many, closely cespitose; ultimate segments roundish or irregularly oval.....8. *C. covillei.*
Leaves few, larger, spaced 2½ to 5 lines apart; ultimate segments mostly subcordate-orbicular.....9. *C. clevelandii.*

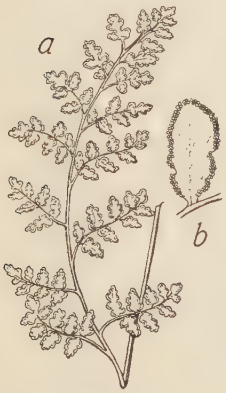
1. **C. califórnica** Mett. Fig. 11. Plants 6 to 11 in. high, the stalks densely tufted, dark brown, glossy; fronds green, broadly deltoid-ovate, finely quadripinnatifid, 1½ to 3½ in. long; upper divisions of the rachis with a narrow herbaceous border; ultimate segments lanceolate, incised, 1 to 1½ lines long; sori one to each fertile veinlet, the lunate indusia in the sinuses between the teeth of the segments.—Moist shady places or in dry rock crevices in the

foothills; frequent in cismontane S. Cal.; n. in the Coast Ranges to Sonoma Co. and in the Sierra Nevada to Butte Co., but rare.

2. **C. víscida** Davenp. Densely tufted, 3 to 12 in. high; rootstocks densely clothed with red-brown lanceolate scales; herbage minutely glandular or glandular-dotted, especially on the stalks and rachises; fronds lanceolate, bi- or tripinnate; pinnae 3 to 7 lines long; pinnules pinnatifid with the oblong segments incised or toothed.—Desert ranges, 1000 to 4000 ft.: Panamint Range; desert slopes of the mountains bordering the Colorado Desert on the west; L. Cal.

11. Cheilanthes californica Mett.; frond x 1.

3. **C. coóperae** Eat. Cooper Fern. Fig. 12. Densely tufted, 1 to 4 (or 8) in. high; herbage hairy and more or less glandular; stalks dark brown; fronds oblong or oblong-lanceolate, bi-pinnate, 2 to 5 in. long; pinnules elliptic, crenate or crenately incised, 2 to 4 lines long.—Crevices of cliffs or rocks in the foothills, infrequent: Sierra Nevada foothills (Eldorado Co.; Calaveras Co.; Duck Bar, Stanislaus River; Wards Ferry, Tuolumne Co.; Hites Cove, Mariposa Co.); Santa Inez Mts.; Slover Mt., San Bernardino; s. to Mex.



12. Cheilanthes cooperae Eat.; *a*, frond x ½; *b*, pinnule x 1½.

4. **C. gracíllima** Eat. Lace Fern. Fig. 13. Densely tufted, 2 to 6 (or 8) in. high; stalks glabrous or nearly so, red-brown; fronds linear or lanceolate, bi-pinnate, 1½ to 2½ in. long; pinnae 2 to 4 (or 6) lines long; pinnules elliptic or ovate, glabrous above, woolly beneath, 1 to 1½ lines long, the terminal one often larger, commonly obliquely lobed at base, often once lobed or once cleft above, the margin strongly reflexed.—Among rocks in the higher mountains, 2500 to 4500 or 8000 ft.: North Coast Ranges from Marin Co. to Siskiyou Co.; Sierra Nevada from Mariposa Co. to Lassen Co.

13. Cheilanthes gracillima Eat.; frond x 1.

5. **C. feèi** Moore. Plants 1½ to 5½ in. high, the red-brown stalks densely tufted, sparingly hairy or often glabrous; fronds lance-ovate, tripinnate, 1½ to 2½ in. long, densely hairy-tomentose beneath, green and sparingly hairy above or glabrate; pinnae 3 to 6 lines long, the secondary pinnae with crowded pinnules; pinnules elliptic or roundish, about ½ line long, the margin weakly recurved.—E. Mohave Desert (Providence Mts.); Charleston Mts., Nev.; B. C. to Ill. and Tex.

6. **C. fibrillòsa** Davenp. Plants 3 to 6 in. high; stipes 2 to 3 in. long; fronds oblong-lanceolate, tripinnate, loosely tomentose, at length subglabrate, 2 to 3 in. long, ¾ to 1½ in. wide; rachises having the scales mixed with a coarse fibre.—Mt. San Jacinto (w. base near the village of Florida); apparently extinct.

7. **C. paríshii** Davenp. Fronds oblong-lanceolate, tri- to quadri-pinnate, both surfaces scantily but coarsely tomentose,

14. Cheilanthes covillei Max.; frond x 1.

3 to 4 in. long; segments roundish, the terminal largest and 3 lobed.—Andreas Cañon, e. base Mt. San Jacinto.

8. **C. covíllei** Max. Fig. 14. Plants 2 to 6 in. high; rootstocks short, ascending; stalks tufted; fronds ovate to ovate-lanceolate, 2 to 4 in. long, green and subglabrous above, the rachises and midribs densely covered beneath with broadly lanceolate scales, these white or soon rusty brown, mostly entire; ultimate bead-like segments numerous, crowded, sometimes suggesting a tesselated pavement, destitute of scales above.—Dry rocky peaks or ridges, 2500 to 6500 ft., both in cismontane S. Cal. and the Colorado Desert, extending n. in the inner Coast Range to Lake Co., in the Sierra Nevada to Eldorado Co., and through the Mohave Desert and thence n. to Inyo Co. and Lassen Co. (C. fendleri Cal. auth.). Var. INTERTÉXTA Max. Segments bearing a few minute scales above; scales beneath copiously ciliate, entangled, forming a loose tomentum.—Mendocino Co. to the Santa Cruz Mts. and Mt. Hamilton Range.

9. **C. clevelándii** Eat. Plants 6 to 12 in. high; stalks rather scattered or loosely tufted; fronds 4 to 8 in. long, ovate-lanceolate tri- to quadri-pinnate, glabrous and green above, rusty brown beneath with a densely imbricated covering of broad ciliated scales; ultimate segments numerous, crowded, round, ¼ to ½ line broad, the terminal ones a little larger.—Foothills: San Diego and Riverside Cos.; Santa Barbara Co.

8. PELLAÈA Link. CLIFF BRAKE

Small rock ferns. Stalks usually dark-colored. Sterile and fertile fronds much alike, 1 to 4-pinnate, generally glabrous and sometimes glaucescent. Sori roundish or oblong, seated near the ends of the veins, often confluent in a submarginal band. Indusium membranous, often broad, continuous round the pinnules and derived from their reflexed margins. (Greek pellos, dusky, referring to the leaf stalks.)

15. Pellaea bridgesii Hook.; *a*, fertile frond; *b*, sterile frond. x ½

Fronds simply pinnate.
- Pinnae entire, coriaceous, the veins usually not visible ..... 1. *P. bridgesii.*
- Pinnae 2-parted or mostly so, thin, the veins clearly visible ..... 2. *P. breweri.*

Fronds bi- or tri-pinnate.
- Fronds bipinnate only; pinnules acute or mucronate.
  - Fronds linear in outline; secondary rachises very short, the linear-elongated pinnules very closely crowded ..... 3. *P. brachyptera.*
  - Fronds lanceolate in outline; secondary rachises mostly ¾ to 1 in. long, the oblong pinnules closely set but not crowded ..... 4. *P. compacta.*
- Fronds bipinnate or partly tripinnate.
  - Fronds 2 to 5 times as long as broad; common.
    - Pinnules mucronate, all sessile or nearly so, some of the lower replaced by a cluster of 3 sessile pinnules ..... 5. *P. ornithopus.*
    - Pinnules obtuse or emarginate, the lateral sessile or nearly so, the terminal ones with long petiolules ..... 6. *P. andromedaefolia.*
  - Fronds roundish in outline, nearly as broad as long; pinnules linear, acute at both ends; rare ..... 7. *P. densa*

1. **P. bridgèsii** Hook. BRIDGES CLIFF-BRAKE. Fig. 15. Plants 4 to 5 (or 10) in. high; stalks densely tufted, copper-color; fronds pinnate, 2 to 4½ in. long; pinnules many, roundish-ovate or suborbicular, 2 to 4½ or 6 lines long, the lower shortly stalked, the upper sessile.—Clefts of dry exposed rocks, 6000 to 11,000 ft.: Sierra Nevada from Tulare Co. to Sierra Co.; n. to Ore.

2. **P. brèweri** Eat. SIERRA CLIFF-BRAKE. Fig. 16. Plants very densely tufted, 3 to 6 (or 8) in. high; rootstocks densely dark red-scaly, as if tomentose, the scales attenuate, linear-filiform and very rusty; stalks red-brown;

16. Pellaea breweri Eat.; frond x ½.

fronds simply pinnate, 1½ to 4 in. long; pinnae deeply 2-parted, rarely 3-parted, the divisions ovate to oblong-lanceolate, 5 to 7 (or 10) lines long; veins freely forking.—Under rocks, high Sierra Nevada, 7000 to 11,000 ft., from Tulare Co. to Placer Co., thence to Siskiyou Co.; Panamint Mts.; White Mts.; Nev. to Ida.

17. Pellaea brachyptera Baker; pinna x 1.

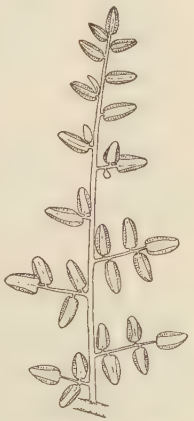
3. **P. brachýptera** Baker. Fig. 17. Plants loosely tufted, 6 to 9 in. high; rootstocks densely scaly, almost as if rusty tomentose with very slender denticulate red-brown scales; stalks red-brown; fronds linear, 3 to 5 in. long, bipinnate, the 3 to 6 pairs of pinnules densely crowded on the short rachises; pinnules linear, 3 or 4 to 6 lines long, the margins inflexed to the midrib in fertile fronds.—Rocks, montane, 4000 to 8000 ft., from Plumas Co. to Siskiyou Co. and Trinity Co.; n. to Ore.

18. Pellaea compacta Max.; pinna x 1.

4. **P. compácta** Max. Fig. 18. Tufted, glabrous, 5 to 7 in. high, evergreen; stalks brown; fronds lanceolate, bipinnate, 3 to 5 in. long; pinnae oblong to ovate, 4 or 6 to 12 lines long; pinnules 3 or 6 to 10 pairs, sessile, closely set but not crowded, oblong, mucronate, 1½ to 2 lines long, spreading at right angles or slightly curved upward, their reflexed or indusial margin strongly inrolled, denticulate.—Dry slopes or flats, montane, 5000 to 6000 ft., Sierra Nevada from Tuolumne Co. southw.; Panamint Mts.; San Gabriel Mts.; San Bernardino Mts.; San Jacinto Mts.

19. Pellaea ornithopus Hook.; pinna x 1.

5. **P. ornithopus** Hook. Bird's-foot Fern. Fig. 19. Plants loosely tufted, 7 to 12 (or 17) in. high, evergreen, dry and brittle; stalks rigidly erect, wiry, mahogany color; fronds bipinnate or partly tripinnate, oblong- or deltoid-lanceolate, bluish or lead-color, 5 to 9 or 14 in. long; pinnae oblong to linear, with about 3 to 5 (or 8) pairs of pinnules; pinnules oblong, mucronate, 1¼ to 2 lines long, sessile or nearly so, spreading at right angles to the rachis, or the lower pairs commonly replaced by secondary pinnae of 3 pinnules, these clusters of 3 resembling the print of a bird's foot.—Driest rocky points and gravelly or bare ledges in the foothills, common, 400 to 4000 (or 5000) ft.: Coast Ranges from Mendocino and Glenn Cos. to San Luis Obispo Co.; Sierra Nevada foothills from Butte Co. to Tulare Co.; Panamint Mts.; w. Mohave Desert; coastal S. Cal.; s. to L. Cal. Sometimes called Tea Fern; also Poison Fern and Black Fern, since causing death to sheep. (P. mucronata Eat.)



20. Pellaea andromedaefolia Fee; pinna x 1.

6. **P. andrómedaefòlia** Fee. Coffee Fern. Fig. 20. Plants very loose or open, 10 to 22 in. high, evergreen; stalks straw-color, slightly chaffy; fronds 4 to 7 in. long, bi-pinnate or partially tri-pinnate; pinnae with 3 to 5 pairs of pinnules or the lower one or two pairs replaced by secondary pinnae of 3 pinnules; pinnules oblong, obtuse, 2 to 5 (or 6) lines long, the lateral sessile or nearly so, the terminal one with a long petiolule.—Rocky soil in the foothills, 1000 to 4000 ft.: cismontane S. Cal.; Coast Ranges n. to Mendocino Co.; Sierra Nevada foothills (Tulare Co. to Amador Co.); Marysville Buttes; s. Ore. Also called Sheep Fern, the wiry stalks breaking into needle-like pieces when eaten by sheep and penetrating the intestines, just as in the case of the Black Fern.

7. **P. dénsa** Hook. Oregon Cliff-brake. Fig. 21. Plants loosely tufted, 4 to 6 in. high; stalks subfiliform

21. Pellaea densa Hook.; frond x 1.

or slender, mahogany color; fronds deltoid- or roundish-ovate, closely tripinnate, ¾ to 2 in. long; pinnules linear, acute at both ends, mucronate, ascending, 3 to 3½ lines long.—Rare, high Sierra Nevada from Tulare Co. to Nevada Co., 6000 to 8500 ft., sometimes in cool cañons as low as 2000 ft.; nw. Mendocino Co. (Leggett Valley); n. to B. C., e. to Wyo. (Cryptogramma densa Diels. Cheilanthes siliquosa Max.)

9. CRYPTOGRÁMMA R. Br.

Rather small ferns with densely clustered stalks and chaffy rootstocks. Leaves bi- to tri-pinnate, glabrous, of 2 kinds, the fertile taller than the sterile. Sori oblong or roundish, soon confluent. Indusium continuous, formed of the reflexed margins of the pinnule, these meeting at the midrib, at length opening out flat. (Greek cryptos, hidden, and gramme, line, referring to the concealed sori.)

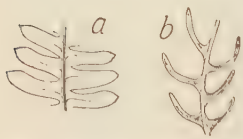
1. **C. acrόstichoides** R. Br. ROCK BRAKE. Fig. 22. Leaves ovate, 2 to 3 (or 5) in. long; sterile leaves with narrowly winged rachises, the pinnules ovate, crenate or slightly incised; fertile leaves with the rachises scarcely winged, the pinnules linear, 3½ to 5 (or 8½) lines long.—Rocky places, high montane, 6000 to 10,000 ft.: San Bernardino Mts.; Sierra Nevada and n. to Modoc Co.; high North Coast Ranges in Humboldt Co.; n. to Wash. and Unalaska.

22. Cryptogramma acrostichoides R. Br.; *a*, fertile pinna; *b*, sterile pinna. x ½.

10. LOMÀRIA Willd.

Tufted ferns with short thick very chaffy erect rootstocks and simply pinnate or pinnatifid leaves. Leaves of 2 kinds, the sterile with broad foliaceous pinnae, the fertile with very narrow pinnae. Sori in a continuous band, one on each side of and parallel to the midrib of the fertile pinnae (but nearer the margin than the midrib), covered till mature by an elongated marginal or sub-marginal indusium. (Greek loma, a hem or edge, referring to the indusium.)

1. **L. spicant** Desv. DEER FERN. Fig. 23. Leaves erect, glabrous, the sterile ones nearly sessile or on short stalks, lance-linear, ½ to 2 or 3 ft. high, pinnatifid to the rachis, the pinnae numerous, closely placed, oblong or oblong-linear, acute or obtuse, often upwardly falcate, ½ to 1½ in. long; fertile leaves taller than the sterile, more erect, long-stalked, pinnate, the pinnae less crowded, very narrowly linear, sessile by a suddenly dilated base; mature sporangia nearly covering the back of the pinnae.—Redwood belt from Santa Cruz Co. to Del Norte Co.; rare in the Sierra Nevada (Eldorado Co., along alpine streams); n. to Alas.; Eur., Asia. Eaten by deer in the spring.



23. Lomaria spicant Desv. Segments of sterile (a) and fertile (b) fronds. x ½.

11. WOODWÁRDIA Sm.

Large ferns with ample pinnate leaves. Rootstocks stout, very densely chaffy with rusty-brown scales. Sori oblong-linear, forming a chain-like row each side of the midribs of the segments. Indusium convex, fixed by its outer margin to the veinlet, free on the inner side. (T. J. Woodward, English botanist.)

1. **W. rádicans** Sm. CHAIN FERN. Fig. 24. Leaves long-stalked, standing in a circle, 4 to 6 or 8 ft. high, oblong-ovate in outline; pinnae oblong-lanceolate, deeply pinnatifid, 6 to 11 in. long, their segments lanceolate, slightly falcate, spinulose-serrulate or sometimes pinnatifid.—Springy spots where

24. Woodwardia radicans Sm.; pinna x ⅛.

there is all-the-year seepage, foothills and mostly lower altitudes in the mountains, 100 to 4500 (or 8000) ft., almost throughout Cal., but not frequent in the Sierra Nevada (Yosemite, Little Chico Creek); Mex., S. Am., Afr., Asia. (W. spinulosa Mart. & Gal.)

12. **ASPLÈNIUM** L. Spleenwort

Medium-sized ferns. Fronds in ours once pinnate, the veins free. Sori oblong or linear, straight, obliquely seated (i. e. oblique to midvein), distinct. Indusium fixed lengthwise by one edge to the upper (inner) side of the fertile vein. (Greek a, without, and splen, spleen, the herbage once used in medicine.)

1. **A. trichómanes** L. var. **vespertìnum** (Max.) Jepson n. comb. Dwarf Spleenwort. Leaves tufted, evergreen, the stalks ½ to 1¼ in. long; fronds once pinnate, linear in outline, 2 to 4½ in. long; pinnae subsessile, oblong to ovate, 3 to 3½ lines long; sori 3 to 7 on each segment.—Under boulders, cismontane S. Cal. (San Bernardino, Millard's Cañon, Pasadena, Pala, Potrero grade, Witch Creek).

13. **ATHÝRIUM** Roth

Medium-sized ferns. Fronds bi- or tri-pinnate. Sori oblong or linear, often curved, seated obliquely on the midvein. Indusium fixed as in Asplenium. (Greek a, privative, and thurium, shield, the application uncertain.)

25. Athyrium filix-foemina Roth var. californicum Butters; pinna x ½.

1. **A. filix-foémina** (L.) Roth var. **californicum** Butters. Lady Fern. Fig. 25. Leaves in large clumps, 2 to 4 ft. high; fronds ovate or lance-ovate, 1 to 2½ ft. long, mostly 6 to 10 in. broad; pinnae oblong-acute or oblong-lanceolate; pinnules oblong, acute, pinnatifid with the lobes toothed at apex, 6 to 14 lines long; sori oblong to oval; indusia toothed or ciliate on the free edge.—Moist usually shady places in the mts., 4000 to 8000 ft. (San Bernardino Mts.; Sierra Nevada and n. to Modoc and Siskiyou Cos.), or along the coast (Santa Barbara Co. to Humboldt Co.); e. to Ida. and Col., s. to Mex.; Eur., Asia. Very variable in leaf form. Var. angústum (Willd.) Farwell. Fronds narrow (2½ to 3 or 4 in. wide), the pinnae ascending or curved upward.—San Mateo Co.; Lake Co.; Siskiyou Co. Var. sitchénse Rupr. Swamp Fern. Fronds mostly very large and broad; pinnules narrowly lanceolate, revolute; sori roundish.—Monterey Coast; San Francisco; lower Klamath River; n. to Alas.

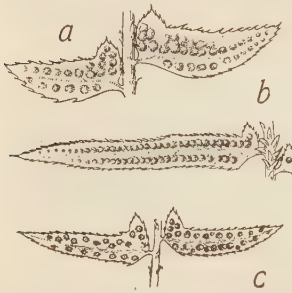
14. **POLÝSTICHUM** Roth

Leaves tufted at the end of a stout rootstock, firm or coriaceous, evergreen, pinnate or bipinnate. Stalks and rachises scaly. Pinnae often with a strong lobe at base on the upper side. Sori round. Indusium peltate, that is, fixed centrally. (Greek polus, many, and stichos, row, the sori in some species many-ranked.)

Large plants; teeth of the pinnae or pinnules spine-tipped.
Fronds simply pinnate.
Fronds scarcely stalked, linear-lanceolate; Nevada Co. to Siskiyou Co..... 1. *P. lonchitis.*
Fronds long-stalked, lanceolate; throughout the state.....2. *P. munitum.*
Fronds bipinnate or bipinnatifid.
Pinnae with many distinct or nearly distinct pinnules or segments; coastal..... 3. *P. aculeatum.*
Pinnae with a basal pair of distinct segments; inner mts.....4. *P. scopulinum.*
Small plants; teeth of the frond segments not spine-tipped; Siskiyou Co....5. *P. lemmonii.*

1. **P. lonchitis** (L.) Roth. Holly Fern. Fig. 26a. Stalks cespitose, very scaly, short (½ to 1½ in. long); fronds evergreen, subcoriaceous, linear or nearly so, acute, pinnate, 6 to 20 in. long, 1¼ to 2½ in. wide; pinnae numer-

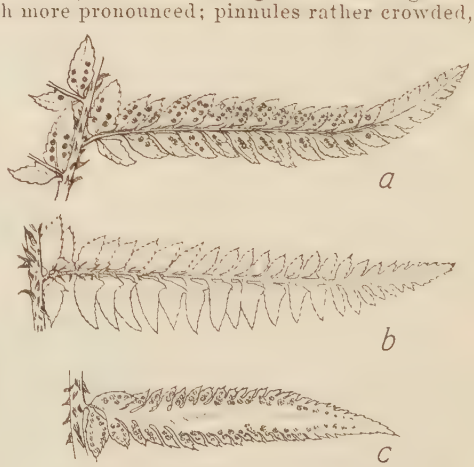
ous, closely set, oblong, falcate, acute, cuspidate-serrulate, ¾ to 1¼ in. long, cuneate at base on the lower side, truncate on the upper with a single strong lobe or auricle; lowest pinnae symmetrically triangular; sori in 2 rows on the pinnae and the auricle; indusium orbicular, attached by the center.—Castle Lake, Nevada Co.; Long Lake, Plumas Co.; Castle Lake, Siskiyou Co.; n. to Alas., e. to Colo. and Nova Scotia; Eur., Asia.



26. *a*, Polystichum lonchitis Roth, pair of pinnae; *b*, P. munitum Presl, pinna, usual form; *c*, pair of pinnae smaller form. x ½.

2. **P. munìtum** Presl. SWORD FERN. Fig. 26b, c. Plants in heavy stools, 1¼ to 5 ft. high, evergreen; stalks with brown lanceolate or subulate scales; fronds lanceolate, simply pinnate, ⅔ to 2⅔ ft. long; pinnae linear-acuminate, nearly sessile, auricled on the upper side at base and obliquely truncate on the lower, serrate with incurved spinulose teeth, 1½ to 2½ in. long, all or only the upper fertile; sori abundant, at length confluent.—Stony slopes or marshy flats in the hills and mountains throughout the state, 100 to 7000 ft., quite common. Var. NUDÀTUM (Eat.) Gilbert. Fronds small (6 to 8 in. long), the stalks scaly only below; pinnae remote, oblong-oval, lobed or slightly auricled on the upper side at base; sori scanty, confined to the ends of the highest pinnae.—Sierra Nevada from Nevada Co. to Mariposa Co. Var. ÍMBRICANS (Eat.) Max. Small; rachis and stalk naked, but the stalk very chaffy at base; pinnae crowded, ascending-imbricated, cuspidate-tipped; sori confined to the upper pinnae.—Mendocino Co.; Plumas Co.; Yosemite.

3. **P. aculeàtum** (Swz.) Roth. BRISTLE FERN. Fig. 27 a, b. Tufted ferns 1 to 3 ft. high; stalks densely scaly at base; fronds oblong-lanceolate, bipinnatifid, ¾ to 2⅓ ft. long; pinnae closely set, linear- to oblong-lanceolate, pinnatifid nearly or quite to the midrib, 1¼ to 4 in. long, the basal segment or pinnule on the upper side much more pronounced; pinnules rather crowded, ovate, incised, sessile, 5 to 9 lines long, the teeth bristle-tipped; sori 4 to 15 to each segment in 2 rows, distinct or confluent. — Near the coast from the Santa Cruz Mts. to Mendocino Co. Var. DÚDLEYI (Max.) Jepson n. comb. Pinnules separated, distinctly short-stalked, mostly auricled, slightly incised, the basal one largest and again pinnatifid; under surface chaffy-fibrillose. —Santa Cruz Mts. Var. CALIFÓRNICUM (Eat.) Jepson n. comb. Fig. 27c. Fronds pinnate, the pinnae slightly incised above the middle, more and more deeply cut below, but their segments not distinct, sessile by a broad base.—Santa Cruz Co. to Mendocino Co. and n. to Mt. Eddy.



27. *a*, Polystichum aculeatum Roth, upper fertile pinna; *b*, lower sterile pinna; *c*, var. californicum Jepson, pinna. x ½.

4. **P. scopulìnum** (Eat.) Max. Fig. 28. Similar to no. 3; stalks very short; fronds partially bipinnate, 6 to 10 in. long, 1½ to 2 in. wide; pinnae ovate or oblong-ovate, rather obtuse, 7 to 9 lines long; upper pinnae spinulose-serrulate, not incised or divided but often with a marked lobe or tooth on the upper side at base; lower pinnae with a pair of distinct pinnules at base, the upper or main part of the pinna incised or serrate.—Montane, 6000 to

6500 ft.: Snow Cañon, San Bernardino Mts.; Nelson Creek, Plumas Co.; Mt. Shasta; also Garberville, Humboldt Co., 1500 ft.; Utah to Wash. & Ida.

5. **P. lemmònii** Underw. SHASTA FERN. Stalks 1¼ to 2 in. long, this and the rachis more or less brown scaly; fronds linear, bipinnatifid, 5 to 6½ in. long, about 1 in. wide; pinnules ovate, 6 to 7 lines long, pinnatifid, the segments ovate or oval, sparingly incised or crenate, 3 lines long; sori on the upper pinnae; indusia large and often imbricated.—Mt. Shasta and Mt. Eddy; n. to Wash. (Aspidium mohrioides Eat.)

28. Polystichum scopulinum Max.; pair of lower pinnae showing pair of pinnules at base x 1.

15. **ASPÍDIUM** Swz. SHIELD FERN

Mostly large ferns. Leaves membranous, much dissected. Sori round. Indusia orbicular-cordate or reniform, seated on the midvein or along the sinus. Veins free or the lowest united. (Greek aspidion, a small shield, referring to the indusium.)

Fronds pinnate, the pinnae pinnately parted into regular lobes.
Segments or lobes of the pinnae more or less falcate or upcurved.
Lowest pinnae gradually reduced to mere lobes; Sierra Nevada..1. *A. nevadense.*
Lowest pinnae little shorter than those above; S. Cal.....2. *A. patens.*
Segments of the pinnae obtuse or even truncate; San Bernardino Mts...3. *A. filix-mas.*
Fronds bi- or partly tri-pinnate.
Sori in 2 regular rows on the pinnules; margin of indusium glandular..4. *A. rigidum.*
Sori not in regular rows on the pinnules; indusium not glandular..5. *A. spinulosum.*

1. **A. nevadénse** Eat. SIERRA WATER FERN. Fig. 29. Plants forming tufts, 1 to 2 (or 3) ft. high; stalks short (1 to 2 in.); fronds membranous, lanceolate; pinnae sessile, linear-lanceolate, deeply pinnatifid, 1 to 3 in. long, the lowest pairs distant and much reduced; lobes of the pinnae crowded, oblong-acute, upcurved, lightly resinous-sprinkled beneath, 2 to 3 lines long, the lowest much longer than the others; sori borne on either side the midvein of the lobes but near the margins; indusium minute.—Along streams, mostly higher altitudes, Sierra Nevada from Madera Co. to Plumas Co. and Siskiyou Co.; n. to Ore. (Dryopteris oregana C. Chr.)

29. Aspidium nevadense Eat.; pinna x 1.

2. **A. pàtens** Swz. SOUTHERN WOOD FERN. Fig. 30. Plants 1 to 3 ft. high, the rootstock thick, bearing several leaves at the end; leaves 1 to 4 ft. long, the rachis pubescent; fronds thin-coriaceous, pinnate, thinly pubescent beneath; pinnae linear-acuminate, 2 to 6 in. long, regularly incised with upwardly curved acute lobes, the apex caudate-attenuate and merely serrate or entire.—S. Cal. (Santa Barbara; Eaton Cañon, Los Angeles; Tahquitz Cañon, Mt. San Jacinto); L. Cal. to Fla.

3. **A. filix-más** (L.) Swz. MALE FERN. Plants forming a tuft, 1 to 3 ft. high; fronds membranous, broadly oblong-lanceolate to oblong, pinnate, ¾ to 2 ft. long; pinnae lanceolate-acuminate to oblong-lanceolate, mostly short-stalked, pinnatifid more than half way to the midrib, or the uppermost pinnae merely toothed, 2 to 4 in. long; segments broadly oblong, mostly serrulate at the obtuse or truncate apex, the basal ones symmetrical; sori 1 to 4 on each segment, seated nearer the midvein than the margin.—Known in Cal. only from Holcomb Valley, San Bernardino Mts., 8000 ft.; all continents except Australia.

30. Aspidium patens Swz.; pinna x 1.

4. **A. rígidum** Swz. var. **argùtum** Eat. CALIFORNIA WOOD FERN. Fig. 31. Plants in tufts, evergreen, about 1 to 2¾ ft.

31. Aspidium rigidum var. argutum Eat.; pinna x ½.

high, the stalks very chaffy; fronds subcoriaceous, ovate-lanceolate, bipinnate, 10 to 18 in. long (4 or) 6 to 10 in. wide; pinnae lanceolate or oblong-lanceolate, acuminate, 2 to 4½ in. long, sessile by a narrow or mostly a broad base; pinnules oblong, mostly obtuse, incised or doubly serrate, cuspidate-toothed, 5 to 7 lines long, the lower basal one usually with a semicordate base; sori in 2 rows on the pinnules; indusia orbicular, the margin minutely glandular.—Half-moist stony woods or half-shady slopes in the mountains, 500 to 5000 ft., rather common: San Diego Co. to the San Bernardino Mts. and San Gabriel Mts.; Santa Barbara Isls.; Sierra Nevada; Coast Ranges (most common in the fog belt); n. to B. C.

5. **A. spinulòsum** (Mull.) Swz. var. **dilatàtum** Hoffm. COMMON WOOD FERN. Fig. 32. Plants 1 to 1½ or 3 ft. high; scales of stalks large; fronds subcoriaceous, broadly ovate or triangular-ovate, bipinnate or partly tripinnate, about 1 to 2 ft. long, 5 to 15 in. wide; secondary rachises obscurely wing-margined; pinnae lanceolate or linear-lanceolate or the lower pairs triangular; pinnules oblong-ovate, acute, pinnatifid, spinulose-serrulate, 4 to 9 (or 12) lines long; sori small, borne on the back of the free veins; indusium delicate, round-reniform.—Near the coast on fallen logs in the shade of dense woods, from Marin Co. (Bear Valley) to Humboldt Co. (Alton); n. to Alas., e. to N. Eng.

16. WOÓDSIA R. Br.

Small tufted ferns. Sori round, seated on the back of the free veins. Indusium very delicate, sometimes evanescent, fixed to the receptacle under the sorus and in ours concealed by it, stellately and often very deeply divided so as to make irregular lobes or a fringe, or reduced to a few hairs. (Joseph Woods, English botanist.)

Leaves glabrous, bright green.....1. *W. oregana.*
Leaves finely glandular-puberulent, dull green.....2. *W. scopulina.*

1. **W. oregàna** Eat. Leaves glabrous, lance-oblong in outline, pinnate, 5 to 9 in. long, the sterile ones shorter than the fertile; pinnae many, oblong-ovate, 5 to 12 lines long, deeply pinnatifid into toothed lobes; sori submarginal, sometimes covered by the reflexed teeth of the lobes; lobes of the indusium hair-like.—San Bernardino Mts.; n. Sierra Nevada, 4000 to 5000 ft., from Sierra Co. to Lassen Co. and Modoc Co.; n. to Ore.

2. **W. scopulìna** Eat. Similar to no. 1; stalks, rachis and lower surface of leaves furnished with scattered slender hairs and stalked glands; leaves lanceolate in outline, finely glandular; lobes of the indusium broader at base.—Exposed rocks, 4000 to 9000 ft., infrequent: Sierra Nevada from Tulare Co. to Sierra Co. (Mt. Silliman; South Fork San Joaquin River; Yosemite; Mono Pass); Providence Mts.; n. to the Modoc lava beds; far n. to B. C., e. to Ariz.

32. Aspidium spinulosum var. dilatatum Hoffm.; primary pinna x ½.

17. CYSTÓPTERIS Bernh.

Delicate ferns with small leaves. Leaves bi- or tri-pinnate or bipinnatifid. Sori rather small, seated on the back of the free veins, covered when young with a delicate hood-like indusium attached by a broad base to the veinlet on the inner side, soon thrown back by the ripening of the sporangia and becoming somewhat cleft or jagged. (Greek kustis, bladder, and pteris, fern, the indusium inflated.)

1. **C. frágilis** (L.) Bernh. BLADDER FERN. Fig. 33. Leaves oblong-lanceolate, bipinnate, 4 to 14 in. long; pinnae ovate-lanceolate, pinnate or pinnat-

33. Cystopteris fragilis Bernh.; frond x ½.

ifid, the pinnules pinnatifid or incised, sessile by a narrow or more commonly a broad base.—Wet rocks or stony stream banks: high mts. of S. Cal. 5000 to 8500 ft.; Sierra Nevada (2000 to 10,000 ft.); Coast Ranges (700 to 6000 ft.) from the Santa Cruz Mts. to Siskiyou Co.; White Mts. (10,300 ft.) of Inyo Co.; n. to Unalaska; cosmop.

SALVINIÀCEAE. Salvinia Family

Small floating plants with dorsiventral stems, the two rows of leaves borne on the upper side, the roots on the lower. Sporocarps borne 2 or more on a common stalk, each 1-celled and having a central simple or branched receptacle which bears sporangia, some sporocarps containing macrosporangia with solitary macrospores, others containing microsporangia with many microspores.

1. AZÓLLA Lam.

Stems pinnately branched, covered with minute imbricated 2-lobed leaves. Sporocarps borne in pairs on the under side. (Origin of name doubtful.)

1. **A. filiculoides** Lam. Duckweed Fern. Moss-like plant, often reddish, the stems 3 to 12 lines long; leaves ovate, about ½ line long.—Quiet waters, commonly gregarious and often covering considerable surfaces, scattered throughout the state, 500 to 1000 ft.: Willow Creek Valley, Modoc Co.; Greenwood, Mendocino Co.; San Francisco; Lagrange, Stanislaus Co.; Miramonte, Kern Co.; Inyo Co.; San Bernardino; Ramona; Grapevine Spr., e. of Warner Pass, San Diego Co. Also S. Am.

MARSILEÀCEAE. Marsilea Family

Small perennial herbs with the slender creeping rootstock rooted in mud and with long-petioled leaves. Sporocarps borne on peduncles which arise from the rhizome, and containing both macrospores and microspores.

Leaves with cuneate or fan-shaped leaflets; sporocarps ovoid or bean-shaped. 1. Marsilea.
Leaves filiform; sporocarps globose. 2. Pilularia.

1. MARSÍLEA L.

Aquatic. Leaves with 4 leaflets at apex of the long petiole, circinnate when young. Peduncles arising from the rhizome near the base of the petiole, bearing the sporocarps in pairs or solitary. Sporocarps with 2 teeth near the base, its cells arranged in 2 vertical rows; on germination a gelatinous worm-like mass emerges bearing a large number of sporangia somewhat pinnately arranged. (Aloysius Marsigli, early Italian patron of botany.)

1. **M. vestita** H. & G. Clover Fern. Leaflets broadly cuneate, entire, usually hairy, 2 to 7 lines long; peduncles short, bearing a solitary sporocarp; upper tooth longest, acute, the lower obtuse.—Eagle Lake; Chico; Yuba Co.; Lemon Cove; Visalia; Ramona; Cuyamaca.

2. PILULÀRIA L.

Aquatic. Leaves needle-like. Peduncles short or almost none, borne in the axils of the leaves. Sporocarps longitudinally 2 to 4-celled, the cells with parietal placentae that bear on the upper portion microsporangia and on the lower portion macrosporangia containing solitary macrospores. (Latin pilula, a little ball, alluding to the shape of the fruits.)

1. **P. americàna** A. Br. Pill-wort. Leaves 1 in. long; sporocarps about 1 line broad, 3-celled, attached by the side to a short peduncle.—Rain pools on the mesas, Santa Barbara to San Diego.

EQUISETÀCEAE. Horse-tail Family

Rush-like often branching plants with running rootstocks. Stems jointed, in ours hollow with solid nodes and sheaths at the joints, the fertile stems terminated by a cone-like spike composed of shield-shaped stalked scales bearing the sporangia beneath. Spores all alike.

1. EQUISÈTUM L. Horsetail

Rootstocks perennial, jointed, branched, the roots in whorls from the nodes, annual. Stems usually erect, regularly striated or ridged, the stomata borne in the grooves in rows; internodes with a large central air-passage and with smaller air-passages (vallecular canals) beneath the grooves and smaller ones (carinal canals) beneath the ridges. Leaves much reduced, simple, united into a sheath at the nodes, their tips thinner and prolonged into teeth. (Latin, equus, horse, and seta, bristle.)

Spikes tipped with a rigid but often bluntish point; above-ground stems perennial (evergreen), tall and rigid, usually without whorls of branches; stomata commonly in single rows; teeth of the sheaths short, deciduous, leaving a cleancut upper border.
- Sheaths short-cylindric, appressed, not widened above; stems rough...1. *E. hyemale.*
- Sheaths widened upwards so as to appear more or less funnel-shaped; stems smooth..2. *E. laevigatum.*

Spikes rounded or merely acute at apex, without a rigid point.
- Above ground stems all alike, green; teeth of the sheaths short.
  - Fertile stems usually not branched but sometimes with whorls of minute branches; stems very rough with cross bands of silex.....3. *E. funstonii.*
  - Fertile stems branched, usually with numerous whorls of branches; stems not roughened with cross bands of silex.....4. *E. palustre.*
- Above ground stems of two kinds, the sterile ones green and with whorls of numerous branches, the fertile brown and simple, withering after the spores are shed; teeth of the sheaths ½ to as long as the sheath itself.
  - Sterile stems 2 to 7 ft. high, the branches several-angled, terete; fertile stem 1 to 1½ ft. high, robust; spike 2 to 3 in. long, its axis hollow.....5. *E. telmateia.*
  - Sterile stems mostly 1 to 1½ ft. high, the branches sharply 3 or 4-angled; fertile stem 4 to 7 in. high; spike 1 to 1½ in. long, its axis solid.....6. *E. arvense.*

1. **E. hyemàle** L. var. **californìcum** Milde. Common Scouring-rush. Stems stout, stiffish, evergreen, rough, 8 to 34-furrowed, 2 to 4 ft. high, simple or rarely with a few short and occasionally fertile branches; ridges with two indistinct lines of tubercles; grooves with a single row of stomata on each side; sheaths rather long, cylindric, appressed, commonly marked with a black girdle at base and top and separated by an ashy band; leaves with a deep central groove, obscurely 4-carinate; teeth long and flexuous, brown, soon deciduous; spikes narrowly white-bordered.—Uncommon, Berkeley, Sacramento. Var. robústum (A. Br.) A. A. Eat. Stems of one kind, unbranched or sometimes with short branches the second year, the ridges with one row of tubercles; sheaths whitish, ¼ to ½ in. long, with a broad black band below and a narrow or penciled black band above just at the base of the deciduous teeth; leaves usually 3-carinate; spike ovate, about ½ in. long.—By streams and in marshy places in the hills and mountains: Coast Ranges, 100 to 2500 ft., from Humboldt Co. to S. Cal., 2500 to 5000 ft. (E. robustum A. Br.). Var. intermèdium A. A. Eat. Stems 1 to 4 ft. high, 1 to 4 lines in diameter; sheath segments keeled below the middle, often centrally grooved above.—Mendocino Co. Var. herbàceum A. A. Eat. Cespitose, 3 to 10 in. high, the stems ½ to 1 line in diameter; sheaths elongated and very wide-spreading.—Tulare and Kern Cos.

2. **E. laevigàtum** A. Br. Stems slender, 1 to 1½ ft. high, commonly unbranched, pale green, mostly smooth, 10 to 30-furrowed, the stomata in a single regular row on each side of the ridges; sheaths 4 to 6 lines long, widened upwards, the tips of the teeth deciduous, the persistent base forming a narrow black and white limb to the sheath; spikes 5 to 12 lines long.—Sierra Nevada; n. to B. C., e. to Va.

3. **E. funstònii** A. A. Eat. Stems slender, very rough, 10 to 30-grooved, 1½ to 6 ft. high, the ridges with many transverse bands of silex; fertile stems with a whorl of small sterile branches at base; sheaths 3 to 5 lines long, the margin with a narrow black band and strongly incurved in age; spikes slender, 6 to 14 lines long.—Damp or dry soil, often in partial shade: the most common species in cismontane S. Cal., 1000 to 7000 ft.; n. to Monterey Co. and Inyo Co. Var. caespitòsum (A. A. Eat.) Jepson n. comb. Stems 3 to 10 in. high, sometimes 100 in a cluster, very rough; teeth persistent, becoming white; leaves rounded on the back.—San Bernardino; San Diego. Var. nùdum

(A. A. Eat.) Jepson n. comb. Stems 1 to 2 ft. high, erect, unbranched.—The common form of S. Cal. Var. RAMÒSUM (A. A. Eat.) Jepson n. comb. Stems 1 to 2 ft. high with whorls of branches developing at time of fruiting.—San Bernardino.

4. **E. palústre** L. MARSH HORSETAIL. Stems slender, ½ to 1½ ft. high, 5 to 10-grooved, the grooves separated by narrow roughish wing-like ridges, the central canal very small; stomata abundant in the grooves; sheaths loose and somewhat dilated, the teeth whitish-margined; branches simple, few in the whorls; spike 1 in. long.—Wet places, San Mateo Co., only known locality in Cal.; distributed around the north temperate zone.

5. **E. telmateìa** Ehrh. var. **braúnii** Milde. GREAT HORSETAIL. Fertile stems, white, smooth, succulent, 16 to 22-grooved, 1 to 1½ ft. high, ¼ to ½ in. in diameter; sheaths loose, whitish below, brownish above, 1 to 1¾ in. long, often longer than the internodes; internodes usually without stomata; spikes 2 to 3 in. long, ½ to ¾ in. in diameter; sterile stems greenish, 20 to 26 (or 40)-furrowed, 2 to 4 (or 7) ft. high; sheaths ¼ to ½ in. long, whitish, the teeth brownish; branches numerous, simple, 3 to 6 in. long, the ridges rough.—Rich moist ravines: Coast Ranges; Amador Co. foothills; San Bernardino; San Diego Co.

6. **E. arvénse** L. COMMON HORSETAIL. Fertile stems simple, 4 to 7 in. high, internodes with stomata; sheaths 5 to 7 lines long, the teeth almost as long; spikes narrow, 1 to 1½ in. long; sterile stems green, rather slender, 1 to 1½ ft. high, 10 to 15-furrowed, the stomata in 2 rows in the furrows, the sheaths loose, scarious, mostly distant, whitish, ending in about 12 brown teeth; branches numerous, long, mostly simple, solid, 4 (or 3)-angled, the sheaths of the branches 4-toothed.—Sandy wet soil or in swamps, 3000 (or 1000) to 8000 ft.: San Bernardino Mts.; Ventura Co.; Sierra Nevada., e. to the Atlantic, n. to the Arctic; Eur., Asia. Var. BOREÀLE (Bong.) A. A. Eat. Teeth of sheaths acute, black.—Berkeley.

LYCOPODIÀCEAE. CLUB MOSS FAMILY

Low moss-like evergreen perennial herbs. Stems elongated, often much-branched, densely crowded with leaves in 4 to 16 rows. Leaves lanceolate or subulate, 1-nerved. Sporophylls borne at or near the tips of the branches, similar to the leaves, the sterile portions of the stem passing gradually into the fertile portion without any break, or differing from the leaves, the sporophylls then collected into special apical cones. Sporangia all alike, borne singly in or almost in the axils of the sporophylls. Spores of one kind.

1. LYCOPÒDIUM L. CLUB MOSS

Sporangia coriaceous, flattened, mostly reniform, 1-celled, 2-valved. (Greek lukus, wolf, and pous, foot, from a fancied resemblance to a wolf's foot.)

1. **L. clavàtum** L. RUNNING PINE. Stems 1 to 2 ft. long, creeping, with similar ascending branches; leaves subulate, 2 to 3 lines long, ascending or spreading; fertile branches ending in a slender peduncle (2 to 3 in. long), which bears 1 or 2 to 5 spikes; spikes 1 to 2 in. long.—Forming dense masses on trees, Humboldt Co.; n. to Alas., e. to N. Eng. Cosmop. Very rare in Cal., common beyond our borders.

SELÁGINELLÀCEAE. SELAGINELLA FAMILY

Low moss-like herbs. Stems slender, branched, mostly prostrate and creeping. Leaves small and scale-like in 4 or more ranks, mostly imbricated and channeled dorsally, spinulose-ciliate. Fruiting spikes borne at the ends of the branchlets, often quadrangular, the bracts closely aggregated and resembling the leaves. Sporangia solitary in or near the axils of the bracts, minute, some containing 4 macrospores, the others filled with numerous microspores.

1. SELÁGINÉLLA Beauv.

The only genus. (Latin selago, a plant resembling the savin tree, and ella, the diminutive.)

Plants erect or ascending, with roots only on the lower part; leaves bristle-tipped; Napa Co. to S. Cal. ..... 1. *S. bigelovii.*
Plants trailing or creeping and forming pendent or prostrate spreading masses; stems commonly rooting throughout.
Stems extensively trailing, ½ to 2 ft. long; leaves spreading, bristle-tipped, or merely acute; North Coast Ranges ..... 2. *S. struthioloides.*
Stems creeping, shorter; leaves appressed or spreading in 2 planes.
Leaves not bristle-tipped.
Stems not dorsiventral, the leaves not curving toward the upper side; San Diego Co. ..... 3. *S. bryoides.*
Stems dorsiventral, the leaves curving toward upper side of stem.
Leaves of upper plane oval, obtuse; n. Cal. ..... 4. *S. douglasii.*
Leaves all lanceolate, acute; Colorado desert ..... 5. *S. parishii.*
Leaves bristle-tipped.
Bristles white or whitish; common ..... 6. *S. rupestris.*
Bristles yellowish-green; stems stout, closely branched, 1 to 2½ in. long; Sierra Nevada ..... 7. *S. watsonii.*

1. **S. bigelòvii** Underw. Stems slender, shortly branched, 2 to 8 in. high; leaves narrowly lanceolate, about 6-ranked, appressed-imbricate, 12 to 15-ciliate on either margin, tapering into a white awn; spikes mostly quadrangular, 2 to 8 lines long, at the ends of short lateral branches; bracts ovate, otherwise like the leaves.—Exposed places and rock crevices, Mt. St. Helena to the Santa Lucia Mts. and s. to San Diego Co.

2. **S. struthìoloìdes** (Presl) Underw. Stems slender, widely trailing, the branches and branchlets often coiled like ostrich plumes; leaves linear-lanceolate, shortly 1 to 4-ciliate on either margin; spikes very slender, ½ to 1½ in. long; bracts ovate-lanceolate, otherwise similar to the leaves; macrospores lenticular, indistinctly netted on the basal side.—Del Norte Co.; n. to Ore.

3. **S. bryoìdes** (Nutt.) Underw. Stems with the short branches and branchlets forming a close carpet which is ashen in age; leaves linear-lanceolate, acutish, pale green, loosely imbricated, the margins minutely spinulose-ciliate; spikes short, at the ends of the branches and branchlets, the ovate bracts densely clustered; macrospores honey-combed below with rope-like ridges, papillose above; microspores usually on separate spikes, spinulose.—Dry bare clay hills, San Diego Co. (S. cinerascens A. A. Eat.)

4. **S. douglàsii** (H. & G.) Spr. Stems 3 to 12 in. long, decumbent, the branches 2 to 6 in. long, bi- or tri-pinnately divided; leaves rigid, in 2 planes, those of the upper plane half as long as those of the lower, shortly pointed; spikes ½ to 1 in. long, quadrangular, the bracts deltoid-cuspidate, strongly imbricate.—Damp shades, n. Cal.; n. to B. C. (Lycopodium douglasii H. & G. L. ovalifolium H. & G.)

5. **S. parìshii** Underw. Plants prostrate, close-creeping, much-branched, the stems 2 to 4 in. long, the branches short; leaves broadly lanceolate, acute, brownish below, bright green above, conspicuously 6 to 20-ciliate on either margin, coiling over the stems when dry; spikes quadratish, 2 lines long, at the ends of short branches, the bracts similar to the leaves; macrospores yellow, globose, microspores orange-yellow, sphero-tetrahedral, long remaining united in tetrads.—Colorado Desert; s. to Mex.

6. **S. rupéstris** (L.) Spr. var. **bolànderi** (Hier.) Jepson n. comb. Stems prostrate, cespitose, branching, not dorsiventral, scarcely 2¼ in. long; leaves linear-oblong, the margins 8 to 15-ciliate; spikes horizontal, at the ends of the branches, not over 2½ lines long; bracts ovate-triangular, short acuminate, 10 to 20-ciliate; macrospores with more or less regular net-like thickenings of the membrane.—Mostly on rocks, Auburn, Placer Co. Var. HANSÈNII (Hier.) Jepson n. comb. Stems dorsiventral, prostrate, 1½ to 2½ in. long; leaves glaucous, linear-lanceolate, 6 to 12-ciliate on either margin, curving toward the upper side of the stem; spikes terminating the branchlets, 4½ lines long; bracts ovate-triangular, acuminate, 25 to 30-ciliate on either margin; macrospores tetrahedral or globose with slight crown-shaped rings on the outer surface.—Lower altitudes, Sierra Nevada from Butte Co. to Fresno Co. Var. FÉNDLERI Underw. Stems prostrate, loosely cespitose, rather remotely branched, 3 to 6 in. long; leaves lanceolate, 5 to 7-ciliate on either margin; spikes erect, 2½ to 9 lines long, at the ends of the branchlets; bracts

ovate-triangular, 12 to 15-ciliate on either side, otherwise similar to the leaves; macrospores reticulate-tuberculate, with short prominent commissural ribs; microspores minutely puncticulate, the commissural side with radiate striae.—Mendocino and Sonoma Cos.; Col. to N. Mex.

7. **S. watsònii** Underw. Stems stout, creeping, 1½ to 2½ in. long, sparingly short-branched; leaves thick, short-lanceolate, deeply channeled dorsally, the margins with 4 to 9 cilia or none, the thickened tips ending abruptly in a short yellowish-green bristle; spikes sharply quadrangular, 6 to 11 lines long; bracts ovate, otherwise similar to the leaves.—High n. Sierra Nevada; e. to Utah.

ISOETÀCEAE. Quillwort Family

Aquatic or marsh plants, with an extremely short unbranched corm-like stem, crowned with a tuft of rush-like or awl-like leaves. Sporangia of 2 sizes, borne singly in the axils of the leaves, each containing only one kind of spore. Spores of 2 sizes and kinds, macrospores and microspores.

1. ISÒETES L. Quillwort

Stem fleshy, very short and depressed, the under side bearing roots, the upper side bearing the leaves. Leaves at base dilated into a sheath with a groove, above rounded or somewhat angular, bearing a bast-bundle in the center and 4 or more in the periphery with 4 air-canals in the intervening area. Sporangia plano-convex, seated in the grooves at the base of the leaf and more or less covered by the velum (formed from the thin edges of the groove). Macrospores with an elevated ridge or equator about the middle, with 3 others (commissures) arising from this and meeting at the top of the upper hemisphere. Microspores obliquely oblong, triangular in section. (Greek isos, ever, and etas, green, the application uncertain.)

Aquatic plants.
- Submerged, normally growing under water, only in unusually dry seasons coming above the surface; leaves quadrangular, without peripheral bast-bundles; velum incomplete.
  - Stomata lacking; sporangia not spotted, covered with a narrow velum.
    - Leaves 10 to 18, 2 to 3 in. long ..... 1. *I. lacustris.*
    - Leaves 5 to 10, ½ to 1 in. long ..... 2. *I. pygmaea.*
  - Stomata few.
    - Sporangia orbicular to broadly elliptic, spotted, ½ to ¾ covered by a broad velum ..... 3. *I. echinospora.*
    - Sporangia broadly oblong, mostly not spotted, with a narrow velum ..... 4. *I. bolanderi.*
- Amphibious, partly emerged, submerged only in the earlier period of growth or temporarily.
  - Velum partial; Coast Ranges and Sierra Nevada ..... 5. *I. howellii.*
  - Velum complete; San Diego ..... 6. *I. orcuttii.*

Terrestrial plants, maturing when entirely out of water; stomata abundant.
- Velum partial or almost wanting ..... 7. *I. melanopoda.*
- Velum complete ..... 8. *I. nuttallii.*

1. **I. lacústris** L. var. **paupércula** Engelm. Stem bilobed; leaves obtusely quadrangular, acute but scarcely tapering, dark or olive-green; ligula triangular; macrospores marked with irregular ridges; microspores somewhat granulated.—Castle Lake, Mt. Shasta, 7000 ft. (I. occidentalis Henderson).

2. **I. pygmaèa** Engelm. One of the smallest species, the stout rigid bright green leaves rapidly tapering to a fine point, and with very short almost square epidermal cells; macrospores marked with minute warts; microspores brown, almost smooth.—Cold running water, e. slope of Mono Pass at 7000 ft.

3. **I. echinóspora** Dur. var. **braúnii** Engelm. Rather small; leaves 13 to 15, soft, green or reddish-green, erect or spreading, 3 to 6 in. long, tapering, usually with stomata only towards tip; macrospores covered with broad retuse spinules; microspores smooth.—Cal. (acc. Britton); n. to Alas., e. to N. J.

4. **I. bolánderi** Engelm. Small-sized; stem deeply 2-lobed; leaves 5 to 20 (or 25), erect, soft, bright green, 2 to 5 in. long, tapering to a fine point, the stomata few; ligula triangular; macrospores marked with minute points and wrinkles; microspores usually spinulose.—Shallow mountain lakes or lake-

lets, Sierra Nevada, 5000 to 10,000 feet. Var. SÓNNEI Henderson. Leaves shorter, more rigid; macrosporangia almost orbicular, spotted with small dark spots; velum wide, covering ⅓ to ⅔ the sporangium.—Donner Lake.

5. **I. howéllii** Engelm. Medium-sized; leaves 10 to 25, bright green, 5 to 8 in. long, with thick dissepiments; stomata always present; sporangia oval, spotted or unspotted, 1½ to 2½ lines long, ¼ to ½ covered by the velum; ligula subulate, equaling sporangium; macrospores rough with prominent rounded single or confluent tubercles.—Borders of ponds, Coast Ranges and Sierra Nevada; n. to Ore.

6. **I. orcúttii** Eat. Stem slightly trilobed, globose, 1 to 2 in. high; leaves 6 to 15, triangular-winged at base; bast-bundles 2, weak; stomata none(?); ligula lunate or semi-circular; macrospores very small, polished, finely pitted and often sparsely mealy; microspores dark brown, spinulose.—Winter pools on mesas, San Diego Co.

7. **I. melanópoda** J. Gay var. **pállida** Engelm. Stem subglobose, deeply bilobed; leaves 15 to 60, slender, stiff, erect, bright green, pale at base, (2 or) 5 to 18 in. long; sporangia oblong, 2 to 5 lines long, spotted, ¼ to ⅓ covered by the velum; polygamous; macrospores with depressed tubercles often confluent into worm-like wrinkles, or almost smooth; microspores spinulose.—San Diego; Upland; Monterey; Kaweah River; s. to L. Cal., e. to Ill.

8. **I. nuttállii** A. Br. Stem almost globose, trilobed, slightly grooved; leaves 20 to 60, 3 to 4 in. long, slender, bright green, with only 3 peripheral bast-bundles; sporangium oblong or oval; macrospores variable in size, densely covered with minute but prominent rounded warts or rarely almost smooth; microspores papillose, brown.—Banks of streams, Marin Co.; Ore. to Wash.

Subkingdom SPERMATÓPHYTA. Seed Plants

Plants without distinct alternation of generations, the leafy plant (sporophyte) bearing ovules and stamens in which the gametophyte is extremely reduced or masked. Microspore or pollen grain typically transported through the air to the vicinity of the oosphere (or egg-cell) where it germinates and gives rise to a non-motile sperm. Fertilized oosphere developing into an embryo contained in the resting body or seed.

Class 1. GYMNOSPÉRMAE. Cone-bearing Plants

Cone-bearing trees or shrubs, all of ours evergreen; leaves needle-like, narrowly linear, awl-like or scale-like. Ovules and seeds borne naked on the surface of a scale; stamens and ovules in catkin-like clusters; sperm passing to the oosphere directly through the micropyle; embryo with 2 to 17 cotyledons.

PINÀCEAE. Pine Family

Trees or shrubs. Leaves narrowly linear and alternate, or with bundles of needle-like leaves in the axils of scale-like (primary) leaves. Stamens and ovules in different catkins, usually on separate branches but always on same tree. Staminate catkins with numerous spirally arranged stamens, each bearing two pollen-sacs. Ovulate catkins with spirally arranged scales, each subtended by a distinct bract; ovules naked, 2 at the base of each scale on the upper side, maturing into seeds which commonly bear a wing derived from the surface tissue of the scale. Fruit a woody cone.

Cones pendent or spreading, falling from the tree whole, the scales persistent.
Leaves of 2 kinds, needle-leaves in fascicles of 1 to 5 and scale-leaves; cones maturing the second year, their bracts minute. . . . . 1. PINUS.
Leaves of 1 kind, linear; cones maturing in the first year, their bracts obvious.
Bracts shorter than the scales; branchlets roughened by the persistent leaf bases.
Leaves petioled, jointed on the woody base which is somewhat decurrent on the branchlet; trunk bark fissured or smoothish, not scaly. . . . . 2. TSUGA.

Leaves sessile, jointed on the woody peg-like base which spreads at right angles to the branchlet; trunk bark marked by scars of deciduous scales.....3. PICEA.
Bracts longer than the scales, notched at apex with a spear-like point in the notch; leaf-scars smooth; old bark very rough.....4. PSEUDOTSUGA.
Cones erect on branch, maturing the first year, their scales falling separately; leaf-scars smooth.....5. ABIES.

1. PÌNUS L. PINE

Trees with two sorts of leaves, the primary leaves thin and scaly or chaff-like, bearing in their axils needle-shaped leaves, in bundles of 1 to 5, which emerge from slender buds whose scarious scales sheathe the base of the cluster. Staminate catkins spreading, crowded in a whorl towards the base of the shoot of the same spring. Ovulate catkins erect, 1 to 5 in a subterminal whorl. Cones maturing in the second autumn, reflexed or pendulous, their scales woody, imbricated, the exposed portion (apophysis) often much thickened and bearing centrally an elevated scar or prickly boss (umbo). Cotyledons 4 to 17. (Latin name of the pine.)

WHITE PINES.—Cones subterminal, the apophysis of the cone-scale usually thin and unarmed; needles in 5s; wood light-colored, soft; chiefly high montane.
Cones long-stalked, very long and slender when closed.
Needles 1 to 3¾ in. long; cones 6 to 8 in. long.....1. *P. monticola.*
Needles 2 to 3½ in. long; cones 13 to 18 in. long.....2. *P. lambertiana.*
Cones with short stalks or almost none; needles 1 to 2½ in. long.
Scales very thick at tip, not closely overlapping; cones subglobose, 1 to 3 in. long; subalpine.....3. *P. albicaulis.*
Scale-tips slightly thickened, rather closely overlapping; cones commonly long-ovate, 2 to 5 in. long; desert mts. chiefly.....4. *P. flexilis.*
YELLOW PINES.—Cones subterminal, sessile or nearly so, the scales with a thick apophysis which is umbonate and armed with a prickle; needles in 5s, 3s, or 2s; wood very pitchy.
Needles in 5s.
Cones oblong-ovate, 2½ to 5 in. long; scales with minute prickles; needles ¾ to 1 in. long; Mt. Whitney region and high North Coast Ranges.....5. *P. balfouriana.*
Cones slender ovate, 3 to 3½ in. long; scales with long slender prickles; needles 1 to 1½ in. long; desert ranges.....6. *P. aristata.*
Needles in 3s, 5 to 10 in. long; cones breaking through near base when falling, some scales remaining on branch.
Cones ovate, 3 to 5 in. long; common at middle altitudes.....7. *P. ponderosa.*
Cones round-oval, 5 to 10 in. long; at higher altitudes.....Var. *jeffreyi.*
Needles in 2s, 1 to 2¾ in. long.....8. *P. contorta.*
NUT PINES.—Cones lateral or subterminal, the scales strongly thickened at tip or prolonged into conspicuous spurs or hooks; seeds large, thick shelled, the wing short or none; needles 1 to 5 in a cluster; arid areas and chiefly low altitudes.
Cones very large, with highly developed spurs, breaking through near base when falling, a few lower scales persisting on the branch; needles in 3s.
Cones ovate, 10 to 13 in. long; needles erect, 5 to 14 in. long; trunk persisting through crown as one main axis; foliage yellowish; South Coast Ranges and Southern California.....9. *P. coulteri.*
Cones round-oval, 6 to 10 in. long; needles drooping, 7 to 13½ in. long; trunk branching into several secondary axes; foliage gray; dry interior foothills.....10. *P. sabiniana.*
Cones with pyramidal apophyses.
Needles in 5s, 8 to 12 in. long; cones triangular-oval, 4 to 5½ in. long; scales with pyramidal apophyses; local on south coast.....11. *P. torreyana.*
Needles not in 5s; cones subglobose.
Needles commonly in 4s; cones ¾ to 1½ in. long; S. and L. Cal.; var. parryana of.....12. *P. cembroides.*
Needles 1 in a place; cones 2½ to 3½ in. long; desert ranges; var. monophylla of.....12. *P. cembroides.*
CLOSED-CONE PINES.—Cones lateral, sessile, one-sided, opening tardily, often remaining closed for many years, their scales conspicuously swollen at tip; needles in 3s or 2s, 3 to 6 in. long; lower altitudes, chiefly of coast.
Needles in 2s; cones ovate, 2 to 3 in. long, often developing stout spurs; seashore...13. *P. muricata.*
Needles in 3s.
Cones broadly ovoid, 2½ to 4½ in. long; seashore.....14. *P. radiata.*
Cones oblong-ovate, 3 to 6 in. long; montane.....15. *P. tuberculata.*

1. **P. monticola** Don. SILVER PINE. Forest tree 50 to 175 ft. high, trunk 1 to 6 ft. in diameter, the bark whitish or reddish, very smooth though slightly checked; needles in 5s, very slender, 2 to 3¾ in. long; cones pendulous, 6 to 8 (or 10) in. long, very slender when closed and usually curved towards the tip, black-purple or green when young, 2½ to 3½ in. broad near the base when open and tapering to the apex; scales thin, smooth, rounded

34. Pinus lambertiana Dougl.; cone x ¼.

at apex, umbo scar-like; seeds 3 to 4 lines long, their wings about 3 times as long; cotyledons 5 to 9, mostly 7 or 8.—Sierra Nevada, in the main timber belt from 6000 to 9500 ft.; Mt. Shasta to Marble Mt. and the Siskiyou Mts.; n. to B. C. and nw. Mont. Wood valuable but the species weakly represented.

2. **P. lámbertiàna** Dougl. SUGAR PINE. Fig. 34. Forest tree 60 to 180 ft. high; trunk 2 to 6 ft. in diameter, its brown or reddish bark 2 to 4 in. thick, roughly fissured longitudinally with the surface breaking down into small deciduous scales; needles in 5s, slender, 2 to 3½ in. long; cones pendulous, borne on stalks at the ends of the branches, commonly in the very summit of the tree, very long-oblong, 13 to 18 in. long, 4 to 6 in. thick when opened; scale-tips thin, with terminal scar-like umbo; seeds 2 to 5 lines long with broad wings twice as long; cotyledons 13 to 16.—Montane, 2500 to 7000 ft.: Sierra Nevada, in the main timber belt; higher Coast Ranges; high mts. of S. Cal.; n. to Ore. Wood very valuable, white, soft and straight-grained.

3. **P. albicáulis** Engelm. WHITE-BARK PINE. Fig. 35. Usually dwarfish or prostrate, sometimes a tree up to 20 or 40 ft. high; trunk ½ to 2 ft. in diameter, often with 2 or 3 main stems from the base; bark thin, whitish and smooth; needles in 5s, 1 to 2½ in. long, densely clothing the tips of the slowly growing branchlets; cones ovoid or subglobose, yellowish brown, 1 to 3 in. long and nearly as thick; scales broad and rounded at apex with a short acute umbo, not overlapping closely but their tips strongly thickened and either projecting freely or presenting very bluntish points; seeds obovate, acute, ⅛ to ¼ in. long; wing narrow, usually persistent on the scale; cotyledons 7 to 9.—Subalpine, 8000 to 12,000 ft.: Sierra Nevada; Salmon Mts. and far n.

35. Pinus albicaulis Engelm.; cone x ½.

4. **P. fléxilis** James. LIMBER PINE. Tree 10 to 60 ft. high with a short trunk 1 to 3 ft. in diameter; needles in 5s, 1 to 2¼ in. long, often curving, densely clothing the ends of the branchlets and forming a sort of brush; cones buff or olive-buff, globose to long-ovate, 2 to 5 in. long; scales broad with rounded slightly thickened tips and terminal scar-like umbo, overlapping rather closely and leaving only a narrow portion free on the upper side the scale; seeds nearly oval, markedly compressed, 4 to 5 lines long; wing narrow, generally persistent on scale; cotyledons 6 to 9.—Subalpine, desert ranges, 7500 to 11,000 ft.: desert slope of s. Sierra Nevada and high mts. of S. Cal.; White, Inyo and Panamint Ranges; e. to Rocky Mts., n. to Alb.

5. **P. bálfouriàna** Jeffrey. FOXTAIL PINE. Subalpine tree, 20 to 45 ft. high, with conical trunk 1 to 4 ft. in diameter at the base; trunk bark reddish brown, smoothish but superficially checked; branches stout and rather short with half-drooping branchlets thickly clothed with short needles persisting 10 to 15 years and thus resembling a fox's tail; needles in 5s, ¾ to 1 in. long; cones slender when closed, oblong-ovate when open, terra-cotta color, 2½ to 5 in. long; tips of the scales thickened or low-pyramidal, with shrunken scar-like umbo; seeds 3½ to 4 lines long, their wings narrow, 6 to 11 lines long; cotyledons 5.—Timber line tree, 6000 to 11,500 ft., local in

two widely separated areas; inner far North Coast Ranges (Scott Mts. to Yollo Bolly Mts.) and high s. Sierra Nevada.

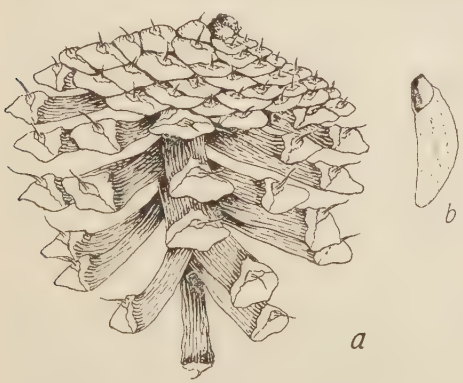
6. **P. aristàta** Engelm. HICKORY PINE. Tree 25 to 55 ft. high; leaves 1 to 1½ in. long; young bark milky white; cones slender ovate, 2 to 3 ½ in. long, the scales armed with slender prickles 3 lines long; cotyledons 6 or 7.—High desert ranges of Inyo and Mono Cos. and eastw. to Col. and n. Ariz., 8000 to 11,200 ft.

7. **P. ponderòsa** Dougl. YELLOW PINE. Fig. 36. Forest tree 60 to 225 ft. high, the trunk 2 to 8 ft. in diameter; bark 2 to 4 in. thick, tawny or yellow-brown, divided by fissures into large plates, or sometimes closely fissured; needles in 3s, 5 to 10 in. long; cones reddish brown, commonly 3 to 5 in. long, narrowly ovate when closed, roundish ovate or oval when open, after opening breaking through near the base and falling, leaving the basal scales on the limb; scales thickened or low-pyramidal at apex, the umbo with a stout somewhat triangular point or short prickle; seeds ovatish, 3 to 4 lines long, the wing broadest near the middle and tapering to apex, ¾ to 1 in. long, and 4 to 6 lines broad; cotyledons 5 to 10.—Sierra Nevada, main timber belt, the most abundant species; higher Coast Ranges; high mts. of S. Cal.; e. to the Rocky Mts., n. to B. C., s. to Mex. Wood valuable, straight-grained, rather resinous.

36. Pinus ponderosa Dougl.; cone x ½.

Var. JÉFFREYI Vasey. Jeffrey Pine. Tree 60 to 170 ft. high with yellowish or wine-colored trunks, the bark broken into roughish plates; cones larger and denser, 5 to 10 in. long, shaped when open like an old-fashioned straw hive; prickle of the umbo often more slender; seeds often obovate, 5 to 7 lines long with a wing 12 or 13 lines long; cotyledons 7 to 13.—High montane, 6000 to 9000 ft.: Sierra Nevada; Mt. San Jacinto and San Bernardino Mts.; Yollo Bolly Mts. to the Siskiyou Mts.

8. **P. contórta** Dougl. BEACH PINE. Scrub pine 2 to 35 ft. high, commonly with depressed or irregular dark green crown, the trunk mostly ¼ to 1¼ ft. in diameter with dark rough bark; needles in 2s, 1¼ to 2 in. long, clothing the branchlets densely; cones narrowly ovate or sub-cylindric, somewhat oblique, globose when open, 1 to 1½ in. long, falling after 4 or 5 years or remaining on the tree many years; apophysis low pyramidal, bearing a very slender prickle which weathers away in age; seeds 1½ to 2 lines long, the wing 3 to 6 lines long; cotyledons 4 or 5.—Seacoast, Mendocino Co. (Albion River) to Del Norte Co. and n. to Alas. Var. MURRAYÀNA Engelm. Tamrac Pine. Fig. 37. Forest tree commonly 50 to 125 ft. high; bark remarkably thin (¼ in. thick), smooth; needles 1½ to 2¾ in. long.—Dry slopes or swampy swales, 6000 to 11,000 ft.: Sierra Nevada; San Bernardino Mts. and San Jacinto Mts.; Mt. Shasta to the Siskiyou Mts.; also far n. and e. Lodge-pole Pine of the northwest. Var. BOLÁNDERI Vasey. Cane-like dwarf 2 to 5 ft. high; cones very small.—Mendocino coastal plain.



37. Pinus contorta Dougl. var. murrayana Engelm.; *a*, cone; *b*, seed. x 1.

9. **P. còulteri** Don. Big-cone Pine. Tree 40 to 90 ft. high with usually spreading crown and long lower branches; bark dark, roughly broken; needles in 3s, erect, tipped with a short hard point, 5 to 10 (or 14) in. long; cones long-ovate, 10 to 13 in. long, 5 to 7½ in. thick, when falling breaking through near the base like the cone of the Yellow Pine; scales at tip drawn out into prominent tusk-like points or spurs which towards the base of the cone on the outer side are developed into curving talon-like appendages; seeds 6 to 8 lines long with a wing twice or nearly twice as long; cotyledons 10 to 17.—Dry rocky mountain slopes, 3000 to 6500 ft.: Mt. Diablo (1200 ft.), Mt. Hamilton, San Carlos and Santa Lucia Ranges to the mts. of S. Cal. Timber poor.

10. **P. sabiniàna** Dougl. Digger Pine. Fig. 38. Tree 40 to 90 ft. high, the trunk in typical trees parting into a cluster of erect branches which form a broom-like top; needles in 3s, drooping, 7 to 13½ in. long; cones on stalks 2 to 2½ in. long, ovate, subglobose when open, 6 to 10 in. long, 5 to 7 in. thick and only slightly unsymmetrical, when falling breaking through near the base and leaving the basal portion on the limb; tips of the scales strongly developed into triangular hooks projecting downwards, about 1 in. long; seeds hard-shelled, oblong, slightly flattened, 9 to 11 lines long, 4 to 5 lines wide, bearing a short wing 3 to 5 lines long and ½ in. broad; cotyledons 11 to 17.—Arid foothills, forming a very thin stand: Sierra foothills; Coast Ranges, mostly toward the interior, reaching the coast only in the Santa Lucia Mts. Timber inferior.

38. Pinus sabiniana Dougl.; cone x⅛.

11. **P. torreyàna** Parry. Torrey Pine. Low crooked or sprawling tree 15 to 35 ft. high, or sometimes straight and 60 ft. high; needles in 5s, 8 to 12 in. long; cones triangular ovate, 4 to 5½ in. long, the scales at apex thickened into heavy pyramids; cotyledons 12 to 14.—Local on the San Diego coast about Del Mar and on Santa Rosa Isl.

12. **P. cembroides** Zucc. var. **parryàna** Voss. Parry Piñon. Short-trunked low tree 15 to 30 ft. high; needles ¾ to 1⅝ in. long, usually 4 (sometimes 2, 3 or 5) in a cluster; cones subglobose, ¾ to 1½ in. long; seeds with rudimentary wings; cotyledons 6 to 8.—San Jacinto Range and s. to L. Cal. (P. parryana Engelm.) Var. mònophýlla Voss. One-leaf Piñon. Low flat-crowned tree 8 to 25 (or 45) ft. high, the trunk very short; needles 1 in a place, cylindric, curving upward, 1½ to 2 in. long; cones subglobose, chocolate-brown or yellow, 2½ to 3½ in. in diameter; scales thick, raised at apex into high broad-based pyramids with slightly umbilicate or flattened summits bearing a minute deciduous prickle; seeds dark brown, oblong in outline, slightly flattened, ¾ in. long, without wings; cotyledons 7 to 10.—Common on desert slopes and ranges; extremely local (4 or 5 stations) on w. slope Sierra Nevada from the Tuolumne River to the Kern River. (P. monophylla Torr.)

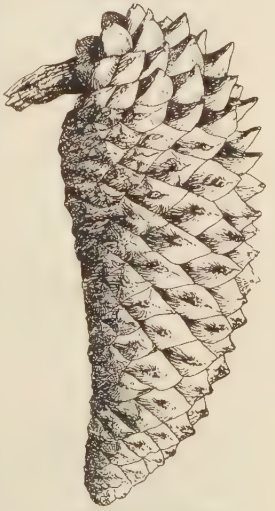
13. **P. muricàta** Don. Bishop Pine. Tree 40 to 80 ft. high, 1 to 3 ft. in trunk diameter; bark dark, roughly fissured; needles in 2s, 4 to 6 in. long; cones broadly ovate, 2 to 3 in. long, almost as thick, or when open more or less globose, borne on the shoot in circles of 3, 4 or 5, gradually turned downward, developed more strongly on the outside towards the base and in consequence always one-sided; scale-tips rhomboidal, bearing a central

39. Pinus radiata Don; cone x ½.

prickle with a broad base, or the highly developed scales towards the base on the outside standing out as very stout straightish or upwardly curving spurs; seeds black, sometimes mottled, the thin shell minutely roughened, 2½ to 3 lines long; wing 5 to 8 lines long; cotyledons 4 to 7.—Low swampy hills or flats or rocky slopes, always near the sea: Luffenholz Creek near Trinidad; Mendocino and Sonoma coasts; Pt. Reyes Peninsula; Monterey; Coon Creek, San Luis Obispo.

14. **P. radiàta** Don. MONTEREY PINE. Fig. 39. Symmetrical tree or in age with flattened or broken top, 30 to 70 or 115 ft. high; trunk 1 to 4 ft. in diameter, the dark hard bark roughly fissured; needles in 3s, or a few in 2s, 3 to 6 in. long; cones tan or cinnamon color, turned downward, sessile and unequally developed, broadly ovoid and bluntly pointed, or globose when open, 2½ to 4½ in. long; scales on the outer side toward the base conspicuously swollen at tip into a hemispherical tubercle or boss and armed with a prickle which usually weathers off; seeds black, minutely roughened on the surface, 3 lines long, bearing a broadly oblong brown wing 2½ to 3 times as long; cotyledons 5 to 7.—Seacoast, only in a few small scattered colonies: Año Nuevo Pt., Santa Cruz Co.; Monterey; Cambria, San Luis Obispo Co.; Santa Rosa, Santa Cruz and Guadalupe Isls.

15. **P. tuberculàta** Gord. KNOB-CONE PINE. Fig. 40. Tree 5 to 30 or 50 ft. high with thin crown and slender trunk; needles in 3s, 3 to 5 in. long; cones strongly deflexed, buff in color, narrowly ovate, oblique, acutely or bluntly pointed and somewhat curved, especially at tip, 3 to 6 in. long; scales moderately thickened at tip, except on the outside towards the base where they are raised into conspicuous rounded or pointed knobs; umbos small and contracted into slender usually deciduous prickles; seeds brownish black, ovatish, 3 to 4 lines long, the surface minutely roughened; wings 9 to 12 lines long, 3 to 4 lines broad, broadest near the middle; cotyledons 5 to 8. —Barren or rocky slopes at medium altitudes, the localities few and widely scattered: Santa Lucia Mts.; Santa Cruz Mts.; Moraga Ridge; Mt. St. Helena; n. to Siskiyou Co., thence s. in the Sierra Nevada to Mariposa Co. The cones persist on the trunk and long slender main branches many (15 to 25) years, forming circles from near the base to the summit. The seeds are seldom liberated except when the cones are heated in a forest fire. It is thus very interesting that a burned forest of Knob-cone Pine is promptly resown with its own seed.



40. Pinus tuberculata Gord.; cone x ½.

2. **TSÙGA** Carr. HEMLOCK

Slender trees with nodding leading shoots. Leaves linear; resin canal 1; petioles jointed on a woody base which persists after leaf-fall as a decurrent projection roughening the branchlet. Staminate catkins pendulous, consisting of a subglobose cluster of stamens on a long peduncle arising from an

axillary winter bud. Anthers subglobose, tipped with a short spur or knob, their cells opening transversely. Ovulate catkins erect, from terminal winter buds. Cones maturing in the first autumn, solitary on ends of branchlets, pendent; scales thin, longer than the bracts. Seeds with resin vesicles on the surface; cotyledons 3 to 6.—(Tsuga, its Japanese name.)

Leaves in flat sprays; cones ½ to 1 in. long.....1. *T. heterophylla.*
Leaves spreading around stem; cones 1½ to 3 in. long.....2. *T. mertensiana.*

1. **T. héterophýlla** (Raf.) Sarg. COAST HEMLOCK. Graceful conifer, 100 to 180 ft. high, with trunk 1 to 4 ft. in diameter, the branches and branchlets slender, forming sprays which droop cascade-wise but not pendulous; trunk bark brown or dark red inside, smoothish or broken into small oblong plates; branchlets finely hairy with the leaves mostly spreading in 2 ranks; leaves linear, flat, 3 to 10 lines long, ½ to 1 line wide, shortly but distinctly petioled; cones oblong or conical when closed, roundish when open, ½ to ¾ or 1 in. long; scales longer than broad, roundish at apex, entire; bracts about ⅛ the length of the scales, broadly triangular with truncate or obtuse summits; seeds light-brown, 1¼ line long, the wing 3 or 4 lines long and twice the breadth of the seed.—Mountain slopes near the sea from Gualala River, Sonoma Co., to Del Norte Co.; n. to Alas. and w. Mont.

2. **T. merténsiàna** (Bong.) Sarg. MOUNTAIN HEMLOCK. Fig. 41. Alpine tree 15 to 90 (rarely 115) ft. high, with conical trunk ½ to 2½ ft. in diameter, bearing branches quite to the ground and forming pyramidal bases which are soon narrowed to slender tops; branches slender, horizontal or mostly drooping, the branchlets slender, pubescent and drooping; leaves standing out all around the branchlet, flattish above, strongly ridged below, bearing stomata on both surfaces, bluntish at apex, ¼ to 1 in. long, less than 1 line wide, shortly petioled; cones cylindric and tapering to base and apex, 1½ to 3 in. long, ½ to ¾ in. in diameter; opened cones oblong or tapering from base to apex, 1 to 1¼ in. in diameter; scales thin, rounded at apex, in the open cone spreading at right angles to the axis or even recurving, their bracts ⅓ to ⅔ as long, rounded above and tipped with a short point; seeds 2½ lines long, the wing 4 or 5 lines long.—Timberline tree, 6000 to 11,000 ft.: Sierra Nevada from Bubbs Creek, Fresno Co., to Mt. Shasta, thence w. to the Salmon and Siskiyou mountains; n. to Alas. and w. Mont.

41. Tsuga mertensiana Sarg.; fr. branchlet x ½.

3. PÌCEA Link. SPRUCE

Trees with tall tapering trunks and thin scaly bark. Leaves narrowly linear, spreading on all sides, jointed near the stem on a woody base which persists after leaf-fall as a prominent spreading "peg"; resin canals in ours 2. Staminate catkins from terminal or axillary winter buds, erect or nodding; anthers with nearly circular toothed crests, opening longitudinally. Ovule-bearing catkins erect. Cones maturing in the first autumn, pendent, usually scattered over the upper half of the tree; scales very thin, the bracts

shorter than the scales. Seeds without resin vesicles; cotyledons 4 to 15. (Picea, ancient Latin name, from pix, pitch.)

Scales of cones thin, serrulate; leaves prickly pointed or cuspidate.
Bracts ½ to ⅔ as long as the scale; coastal.....1. *P. sitchensis.*
Bracts ⅛ to ¼ as long as the scale; montane.....2. *P. engelmannii.*
Scales of cone thickish, entire; leaves merely acute; high montane.....3. *P. breweriana.*

1. **P. sitchénsis** (Bong.) Carr. TIDELAND SPRUCE. Fig. 42. Forest tree 80 to 190 ft. high, with trunk 3 to 20 ft. in diameter, wide spreading rigid branches, and drooping branchlets; trunk bark reddish brown, developing roughish and ill-defined deciduous scales; leaves linear, ½ to 1 in. long, ⅔ to 1 line wide, whitened and flat above but with a median ridge, convex or strongly ridged below, very stiff and usually tapering to a prickly point or the upper leaves less sharp or bluntly pointed; cones dull brown, long oblong, 2 to 4 in. long and when open 1¼ to 1½ in. in diameter; scales narrow, finely and irregularly toothed, with ovate-lanceolate bracts, ½ to ⅔ as long; seeds 1⅓ lines long, the wing 3 to 4 lines long and 1½ to 2 lines broad.—Lowlands facing the ocean, Mendocino Co. to Del Norte Co.; n. to Alas. Extensively lumbered. In cultivation called Sitka Spruce.

42. Picea sitchensis Carr.; fr. branchlet x ½.

2. **P. engelmánnii** Engelm. ENGELMANN SPRUCE. Tree 20 to 50 (or 100) ft. high; branchlets (in ours) glabrous; leaves strongly ridged above and below, cuspidate, 8 to 11 lines long, resin-ducts often 1 or 2; cones oblong, 2 to 2½ in. long, 1½ in. in diameter when open; scales rounded or a little contracted at apex; bract ⅛ to ¼ as long as the scale.—Clark Creek, Shasta Co. (only known locality in Cal.); Ashland Butte, s. Ore.; n. to B. C., e. to Rocky Mts.

3. **P. bréweriàna** Wats. WEEPING SPRUCE. Tree 20 to 95 ft. high; branches clothing the trunk to the ground, few and mainly horizontal, ornamented with cord-like branchlets hanging straight down; trunk ½ to 3½ ft. in diameter, its bark thin, whitish and smoothish, the deciduous scales making irregular but sharply defined scars; leaves roundish and green below, whitish above on either side the conspicuous median ridge, obtuse at apex, ½ to 1 in. long; cones narrowly cylindric, 3½ to 4¼ in. long, 1¼ to 1½ in. in diameter; scales rounded at apex, very thick for a spruce and with smooth entire edges; bracts oblong, acute, ⅛ to ¼ as long as the scales; seeds 1½ lines long, the wing 4 lines long.—High cold hollows or north slopes, 6000 to 7000 ft.: Trinity Mts. to the Siskiyou Mts.; also sw. Ore.

4. PSEÙDOTSÙGA Carr.

Large trees with flat short-petioled leaves spreading around the stem or on horizontal branches often somewhat 2-ranked. Staminate catkins axillary, the pollen-sacs tipped with a spur and opening obliquely. Ovulate catkins erect, terminal or axillary. Cones pendent, maturing in the first autumn, borne all over crown; scales thin, rounded, shorter than the slender acutely

2-lobed bracts which bear a spear-like point in the notch. Seeds without resin vesicles; cotyledons 5 to 12.—In botanical relationship it stands in an intermediate position among the Spruces, Hemlocks and Firs. Its peculiar cone bracts, signally different from those of any other conifer, and the obliquely dehiscing pollen-sacs are the chief marks of the distinctive genus Pseudotsuga. (Greek pseudos, false, and Japanese tsuga, hemlock.)

Cones 1¾ to 3½ in. long; bracts conspicuously exserted; Sierra Nevada and Coast Ranges.....1. *P. taxifolia.*
Cones 4 to 7½ in. long; bracts protruding little; S. Cal. only.....2. *P. macrocarpa.*

1. **P. taxifòlia** (Lamb.) Britt. Douglas Fir. Douglas Spruce. Fig. 43. Magnificent forest tree, 70 to 250 ft. high, the trunk 1 to 8 ft. in diameter; bark on old trees very thick, soft and putty-like, broken into broad heavy furrows; branchlets with the leaves spreading all around the stem or on horizontal branchlets turned more or less to right and left but not in truly flat sprays; leaves linear, blunt at apex, flat with a median groove above and a ridge below, green, with two pale longitudinal bands on the under surface, very short-petioled, ½ to 1½ in. long, ½ to 1 line wide; cones cinnamon or red-brown, long-oval and more or less pointed, 1¾ to 3½ in. long, when open 1¼ to 1¾ in. thick; scales broad and rounded at apex; bracts conspicuously exserted, broadly linear and bearing in the deep notch at apex a spear-like point; seeds 3 lines long, almost as long as the wings; cotyledons 5 to 8.—Moist mountain slopes: Coast Ranges, especially toward the coast, from the Santa Lucia Mts. to Siskiyou Co.; Sierra Nevada from Fresno Co. to Shasta Co.; n. to B. C. Valuable timber tree; known to woodsmen as Red Fir or Yellow Fir, but when manufactured into lumber the product is sold under the trade name "Oregon Pine."

43. Pseudotsuga taxifolia Britt.; *a*, fr. branchlet x ⅓; *b*, bract and scale x ½.

2. **P. macrocárpa** Mayr. Big-cone Spruce. Tree 30 to 60 or occasionally 80 ft. tall, with very long lower branches, the foliage and cones very similar to no. 1; bark dark or black; leaves slightly curved; cones 4 to 7½ in. long, 2 to 3 in. in diameter when open; bracts protruding little or not at all beyond the scales, except the lowest, the tails of which are often as much as ¾ in. long; cotyledons 6 or 7.—Cañons and north slopes: San Emigdio Mts. westw. to the San Rafael and Santa Inez ranges, southw. to the San Gabriel, San Bernardino, Palomar and Cuyamaca mountains, 2500 to 8000 ft.

5. ÀBIES Link. Fir

Highly symmetrical trees of lofty stature, the branches in regular whorls and ramifying laterally, forming flat sprays. Leaves linear, flat, thickened or 4-angled, whitened beneath, spreading in 2 opposite directions or even 2-ranked, or more often curving upwards, leaving a smooth circular scar when they fall. Catkins from axillary winter buds. Staminate catkins borne on the under side of the branches, mostly in the upper half of the tree. Ovulate catkins erect, on the upper side of the topmost spreading branches. Cones erect, maturing in the first autumn, falling to pieces on the tree; scales thin, incurved at the broadened apex; bracts often exserted. Seeds with resin vesicles; cotyledons 4 to 10. (The Latin name.)

Leaves of lower and uppermost branches slightly different; bracts not bristle-like.
Cones 2 to 5½ in. long; bracts not exserted.
Leaves glaucous or dull green with stomata above, flat or on cone-bearing branches keeled above, acute or rarely notched at apex, spreading in two ranks or curving upwards, with a twist in the short petiole; old bark drab or grayish; high montane.....1. *A. concolor.*

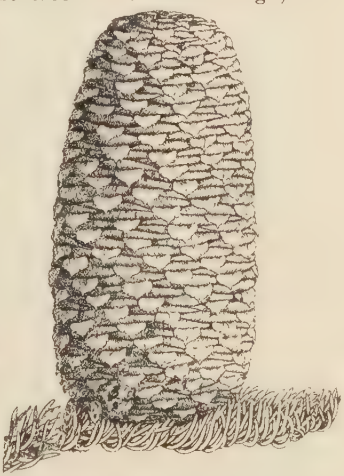
Leaves dark lustrous green, no stomata above, white beneath, notched at apex, usually spreading in two ranks, on cone-bearing branches often blunt, curving upwards; bark white; north coast only.....2. *A. grandis.*
Cones 4 to 8 in. long, the bracts concealed or exserted; leaves ridged above and below so as to be 4-sided, somewhat compressed, thicker on the uppermost branches, curving upwards but not twisted, sessile; old bark reddish brown; high montane.....3. *A. magnifica.*
Leaves alike all over tree; cones with conspicuous bracts, the exserted portion long and bristle-like; bark light brown, smoothish; Santa Lucia Mts. only...4. *A. venusta.*

1. **A. cóncolor** Lindl. & Gord. WHITE FIR. Fig. 44. Forest tree 60 to 150 or 200 ft. high, with a narrow crown and a trunk 1 to 6 ft. in diameter; bark smooth, silvery or whitish in young trees, becoming thick and heavily fissured into rounded ridges on old trunks and gray or drab-brown in color, in section showing dull brown areas separated by a coarse light-colored mesh; leaves ½ to 2½ in. long, flat, often with a median channel on upper side, or on the uppermost branches keeled, a prominent midrib beneath with a broad depressed stomatal band on either side, acutish, obtuse or slightly notched at summit, contracted at base into a very short petiole, spreading in two ranks or more or less erect by a twist in the very short petiole; cones brown, oblong, rounded at summit and base, 2 to 5½ in. long, 1 to 1¾ in. in diameter; bracts about ½ as long as the scales, roundish and finely toothed, often with a notch at top and usually terminating in a short slender point; seeds 5 lines long, the wing 6 or 7 lines long.—Mountain slopes, 3000 to 7000 or 10,000 ft.: Sierra Nevada; high North Coast Ranges; high mts. of S. Cal.; e. to the Rocky Mts. Makes a second-grade saw-timber. Also, but wrongly, called Silver Fir.

44. Abies concolor Lindl. & Gord.; fr. branchlet x ½.

2. **A. grándis** Lindl. LOWLAND FIR. Forest tree 40 to 160 ft. high, the trunk 1½ to 4 ft. in diameter; leaves flat, 1 to 2 in. long, notched at apex, dark lustrous green above and with a median channel, below with two white bands separated by a ridge; cones long-oblong in outline, 2½ to 4 in. long, 1½ to 1¾ in. thick; bracts small, with a short awl-like point set on the roundish apex, ½ as long as the scales; seeds drab-color, 4½ lines long with a wing somewhat longer and twice as broad as the seed; cotyledons 6.—Low hills or valleys near the sea: n. Sonoma Co. to Del Norte Co.; n. to B. C.

3. **A. magnífica** Murr. RED FIR. Superb forest tree 60 to 175 or even 200 ft. high, with a trunk 1 to 5 ft. in diameter and a very narrow crown composed of numerous horizontal strata of fan-shaped sprays; bark on young trees whitish or silvery, on old trunks dark red, very deeply and roughly fissured; leaves ¾ to 1½ in. long, ridged above and below so as to be equally 4-sided, although more or less compressed, acutish at



45. Abies magnifica Murr. var. shastensis Lem.; fr. branchlet x ⅓.

apex, those on the under side of the branches spreading right and left, in the top of the tree more thickened, erect, incurved and hiding the upper side of the branch; cones brown, 4 to 8 in. long, 2½ to 3½ in. in diameter, broadly oval in outline, the broad scales with upturned edges; bracts oblong, acute, not exserted; seeds 7 lines long with a semi-fanshaped wing 8 lines long; cotyledons 9 to 13.—Mountain slopes and ridges, 5000 to 8500 ft.: Sierra Nevada; high North Coast Ranges from n. Lake Co. to Siskiyou Co. Wood straight- and fine-grained, heavy and very durable. Var. SHASTÉNSIS Lem. Shasta Fir. Fig. 45. Bracts enlarged or spatulate at apex, mucronate, exserted.—Sierra Nevada and n. to Mt. Shasta and s. Ore.

4. **A. venústa** (Dougl.) Koch. SANTA LUCIA FIR. Singular montane tree 30 to 75 or 100 ft. high with a narrow crown abruptly tapering above into a steeple-like top; trunk ½ to 2½ ft. in diameter, vested in light reddish brown bark, and bearing short slender declined or drooping branches nearly or quite to the ground; leaves stiff, sharp-pointed, dark green and nearly flat above, below with a white band on either side of the strong median ridge, 1¼ or mostly 1¾ to 2¼ in. long, 1 to 1½ lines wide, mostly 2-ranked; cones elliptic-oblong, 2½ to 4 in. long, 1½ to 2 in. thick, borne on peduncles ½ in. long; bracts wedge-shaped, truncate or notched at summit, the midribs prolonged into a long-exserted bristle ½ to 1¾ in. long and ½ line wide; seeds reddish brown, 3½ lines long with a broad wing 4 to 5 lines long and rounded at apex; cotyledons 7.—Rocky mountain peaks and deep cañons, Santa Lucia Mts.

TAXÒDIÀCEAE. REDWOOD FAMILY

Trees with linear or awl-shaped alternate leaves. Staminate and ovulate catkins on the same tree. Staminate catkins small. Scales of the ovulate catkins spirally arranged, more or less blended with the bract, often spreading horizontally from the axis of the cone and developed into broad flattish summits. Ovules to each scale 2 to 9. Seeds not winged or merely margined

1. SEQUÒIA Endl. REDWOOD

Tall trees with thick, red, fibrous bark and linear, awl-shaped, or scale-like leaves. Staminate catkins terminal on the branchlets or on short lateral branchlets, with many spirally disposed stamens, each bearing 2 to 5 pollen-sacs. Ovulate catkins terminal, composed of many spirally arranged scales, each with 5 to 7 ovules at base. Cone woody, its scales divergent at right angles to the axis, widening upward and forming a broad rhomboidal wrinkled summit with a depressed center. Seeds flattened; cotyledons 2 to 6. (The Cherokee Indian, Sequoyah, who invented an alphabet for his tribe.)

Leaves awl-shaped, ascending all around stem; cones 2 to 3¾ in. long; Sierra Nevada only.....1. *S. gigantea.*
Leaves linear, petioled, spreading in 2 ranks and forming a flat spray; cones ⅝ to 1⅛ in. long; Coast Ranges only.....
2. *S. sempervirens.*

46. Sequoia gigantea Dec.; fr. branchlet x ⅓.

1. **S. gigantèa** (Lindl.) Dec. BIG TREE. Fig. 46. Giant tree 100 to 325 ft. high with columns 80 to 225 ft. to the first limb and 5 to 30 ft. in diameter at 6 ft. above the ground; crown rounded at summit or much broken in age; bark red, deeply furrowed or fluted, ½ to 2 ft. thick; leaves awl-like, 1 to 6 lines long, only the tips free, adherent below

to the stem which they thickly clothe; cones maturing in the second autumn, red-brown, ovoid, 1¾ to 2¾ in. long, composed of 35 to 40 scales; scales with transversely rhomboidal summits and a centrally depressed umbo; seeds numerous, flattened, margined all around with a border, ovatish or oblong in outline, 2½ to 3 lines long.—Western slope of the Sierra Nevada, 5000 to 8000 ft., from Placer Co. to Tulare Co., a longitudinal range of 250 miles but occurring in more or less widely disconnected and limited areas called "groves," 32 in number. The trees have been extensively lumbered and the product marketed as Redwood. The wood is similar to Redwood but more brittle.

2. **S. sempervirens** (Lamb.) Endl. Redwood. Fig. 47. Tall and massive tree 100 to 340 ft. high, the trunk 2 to 16 ft. in diameter; bark ¼ to 1 ft. thick; foliage reddish brown; leaves linear, spreading right and left so as to form flat sprays, ¼ to 1¼ (mostly ½ to ¾) in. long and 1 to 1¼ lines wide, or in the top of adult trees with short linear acuminate leaves 3 to 5 lines long, such branchlets strikingly suggestive of those of the Big Tree; cones oval, reddish brown, ⅝ to 1⅛ in. long, maturing in first autumn; scales 14 to 24; seeds narrowly margined, elliptic in outline, 2 lines long.—This forms a narrow belt along the coast from the Santa Lucia Mts. to the Oregon line, never ranging inland beyond the influence of the sea-fogs, reaching its greatest development in Humboldt Co. It is the tallest tree on the American continent. The wood is light, non-resinous, very straight-grained and exceedingly durable. No other tree has been so important to the development of civilization in California, since the wood, abundant and cheap, is highly useful for all sorts of building and industrial purposes and in manufactures and the arts.

47. Sequoia sempervirens Endl.; fr. branchlet x ½.

CUPRESSÀCEAE. Cypress Family

Trees or shrubs with opposite or whorled scale-like (or rarely linear) leaves thickly clothing the ultimate branchlets. Stamens and ovules in separate catkins terminal on the branchlets. Staminate catkins small, with shield-like stamens bearing 2 to 6 pollen-sacs. Ovulate catkins consisting of several opposite or whorled scales which bear at base 1 to several erect ovules. Cones dry or berry-like, of few scales; scales consisting (morphologically) of a completely blended scale and bract.

Fruit a woody cone; stamens and ovules on same tree.
- Branchlets flattened, disposed in flat sprays; leaves opposite, in 4 rows, the successive pairs unlike; cones maturing in first autumn; seeds 2 to each scale.
  - Scales of cones imbricated.
    - Cones pendent, scales 4 to 7, only the middle pair seed-bearing; seeds unequally 2-winged ..... 1. Libocedrus.
    - Cones reflexed, scales 8 to 12, the 2 or 3 middle pair seed-bearing; seeds equally winged ..... 2. Thuja.
  - Scales of cones peltate; seeds narrowly winged ..... 3. Chamaecyparis.

Branchlets cord-like, not in flat sprays; leaves opposite, in 4 rows, alike; cones maturing in second autumn; seeds acutely margined, many to each scale... 4. CUPRESSUS.

Fruit a berry; seeds 1 to 3 to each fruit; stamens and ovules on different trees; branchlets cord-like; leaves in whorls of 3 or opposite.....5. JUNIPERUS.

1. **LIBOCÈDRUS** Endl. INCENSE CEDAR

Aromatic trees with flattened branchlets disposed in one plane. Leaves scale-like, opposite, imbricated in 4 rows, the successive pairs unlike. Staminate and ovulate catkins terminal on separate branchlets. Staminate catkins with 12 to 16 decussately opposite stamens, each bearing 4 to 6 pollen-sacs. Ovulate catkins consisting of 4 to 8 scales, only one pair ovule-bearing, each scale of this pair with 2 ovules at base. Cone maturing in one season, oblong, composed of 6 imbricated oblong scales. Seeds unequally 2-winged; cotyledons 2. (Greek libas, referring to the trickling of resin, and kedros, cedar.)

48. Libocedrus decurrens Torr.; fr. branchlet x ½.

1. **L. decúrrens** Torr. INCENSE CEDAR. Fig. 48. Forest tree 50 to 125 ft. high with conical trunk 2 to 7 ft. in diameter; bark cinnamon, loose or fibrous in age; leaves minute, 1 to 3 lines long, coherent, also adherent to the stem, free only at the tips, those above and below obtuse but minutely pointed and forming a pair overlapped by the keel-shaped lateral pair; cones red-brown, oblong - ovate when closed, ¾ to 1 in. long, consisting of 2 seed-bearing scales with one septal scale between them and often with 2 small scales at base; scales with a small triangular umbo at tip; seeds 4 lines long, margined on each side from near the base to the apex by two very unequal wings; larger wing ovatish, about 6 lines long.—Mountain slopes, 2000 to 7000 ft.: common in the Sierra Nevada; higher Coast Ranges; mts. of S. Cal.; s. to L. Cal., n. to Ore. Wood soft, fine and straight-grained, highly durable.

2. **THÙJA** L. ARBOR-VITAE

Aromatic trees with scattered branches, the flattened branchlets disposed in one plane. Leaves scale-like, opposite, and imbricated in 4 rows, the successive pairs unlike, adnate with free tips. Catkins terminal. Staminate catkins with 4 to 6 stamens, each with 3 or 4 anther-cells under the subpeltate crests. Ovulate catkins with 8 to 12 erect scales, each with 2 erect ovules at base. Cones small, maturing the first autumn, reflexed; scales 8 to 12, thin-leathery, the lowest and uppermost pairs sterile. Seeds bordered by nearly equal lateral wings so as to be nearly round, their coats with minute resin-cells; cotyledons 2. (Ancient Greek name for a resinous tree.)

1. **T. plicàta** Don. CANOE CEDAR. Giant tree 80 to 190 ft. high, of pyramidal outline, slender branches, drooping sprays and whip-like often nodding leader; trunk 3 to 16 ft. in diameter at the ground but tapering rapidly above; bark cinnamon-red; branchlets repeatedly 2-ranked, forming flat

sprays, thickly clothed with leaves; leaves minute, those on the margin of the flat sprays keeled and acute at tip, those above and below flattish and triangular at apex; cones borne on short lateral branchlets, on opening turned downward beneath the spray, cinnamon color, oblong when closed, ½ in. long; scales 9; seeds winged all around and with a narrow notch at apex, the whole structure 3 lines long.—Along the coast from Humboldt Co. (Bear River Mts.) to Wash. and se. Alas.; inland to Mont. Wood aromatic, light, soft, remarkably durable, extensively manufactured into shingles.

3. **CHAMAECÝPARIS** Spach

Trees or shrubs; leading shoot nodding; branchlets more or less flattened and in flat sprays; leaves scale-like, adpressed, thickly clothing the branchlets, opposite, in 4 rows, the successive pairs in ours unlike. Catkins and cones very similar to Cupressus. Stamens with usually 2 pollen-sacs. Ovules 2 to 5 at the base of each scale. Cones maturing in the first autumn. Seeds winged. Cotyledons 2. (Greek chamai, dwarf, and kuparissos, cypress.)

1. **C. lawsoniàna** Parl. PORT ORFORD CEDAR. LAWSON CYPRESS. Forest tree 80 to 175 ft. high, with straight shafts and narrow pyramidal crown of drooping branches ending in broad flat drooping fern-like sprays; bark reddish brown, smooth or later longitudinally furrowed; foliage fragrant; leaves above and below rhomboidal, glandular-pitted, and overlapped by the keel-shaped ones on the margin; cones globose, consisting of about 7 scales, 3 to 4 lines long; seeds 1½ to 2 lines long, narrowly wing-margined on each edge, the whole structure orbicular.—Moist hillsides or cañon bottoms, nw. Cal. from w. Shasta Co. and n. Humboldt Co. to Siskiyou and Del Norte Cos.; sw. Ore.

4. **CUPRÉSSUS** L. CYPRESS

Trees or shrubs with the leaves small and appressed, scale-shaped and closely imbricated in 4 ranks on the ultimate branchlets, or awl-shaped on vigorous shoots. Staminate catkins terminal on the branchlets, with 3 to 5 pollen-sacs to each stamen. Ovulate catkins upon short lateral branchlets, the ovules numerous, erect, in several rows at the base of the scales. Cones globose to oblong, maturing in the second year, the shield-shaped scales fitting closely together by their margins, not overlapping, separating at maturity, their broad summits with a central boss or short point. Seeds acutely angled or with a narrow hard wing; cotyledons 2 to 5. (Classical name of the Cypress.)

Our species are of very localized occurrence, that is they appear as small "islands" at rather widely separated stations, in the case of nos. 1 and 2 being known only at 1 or 2 approximate stations. The species depend for their separation on characters that are too vague and it might be better to receive a less number of them. Their history is as yet little known and new stations are still being discovered.

Umbos more or less upwardly impressed and more or less crescent-shaped.
  Bark of mature trunks dark brown, roughish and more or less fissured.
    Glands on leaves none or rare; maritime or coastal species.
      Crown with "finger-pointed" branchlets.
        Seeds brown or commonly so; umbos prominent; Monterey coast..... 1. *C. macrocarpa.*
        Seeds black; umbos small; Mendocino coast.....2. *C. pygmaea.*
      Crown compact or smooth; cones with low umbos; Monterey.3. *C. goveniana.*
    Glands more or less present as a closed dorsal pit; montane species..... 4. *C. sargentii.*
  Bark of mature trunks red, smoothish, shining; San Diego Co.....5. *C. forbesii.*
Umbos more or less conical or peak-shaped; leaves with conspicuous dorsal resin pits.
  Umbos all straightish; Piute Mt., Kern Co.....6. *C. nevadensis.*
  Two uppermost umbos horn-like and incurved; n. Cal.....7. *C. macnabiana.*

1. **C. macrocárpa** Hartw. MONTEREY CYPRESS. Fig. 49. Tree 15 to 80 ft. high with broadly conical crown, the spreading branches with the terminal divsions strict and therefore "finger-pointed"; bark strands spirally twisted to the left or straight; leaves not resin-pitted; cones broadly short-cylindric

49. Cupressus macrocarpa Hartw.: fr. branchlet x ⅔.

or oblong, the scales with a central curved thin-edged ridge or umbo, or the umbo sometimes subconical; seeds brown.—Headlands at mouth of Carmel River, Monterey coast.

2. **C. pygmaèa** Sarg. MENDOCINO CYPRESS. Tree 25 to 75 ft. high, the crown with finger-pointed branchlets, or sometimes a low shrub or reduced to a dwarf cane; leaves not resin-pitted; cones 5 to 9 lines long, the umbos small and low; seeds black.—Mendocino coastal plain. Said to become 100 ft. high.

3. **C. gòveniàna** Gord. GOWEN CYPRESS. Shrub 1 to 5 ft. high, its outline compact or smooth; branchlets slender, squarish; leaves without dorsal pits; cones subglobose or oval, 6 to 8 lines long; seeds commonly black.—Monterey.

4. **C. sargéntii** Jepson. Shrub 5 to 10 ft. high; branchlets thickish, obscurely squarish; leaves or many of them with closed dorsal pits; cones 8 to 10 lines long; seeds brown.—On or near serpentine rocks: Santa Cruz Mts. to Mt. Tamalpais, Hoods Peak Range and Mendocino Co. Var. DÚTTONI Jepson n. var. Symmetrical tree 40 to 72 ft. high, the branchlets more or less divaricate; bark strands spirally twisted to right or straight, fissuring into narrow laced ribbons; leaves triangular-ovate, very short, the dorsal pits none or few; cones globose, 8 to 12 lines long, the umbos peak-shaped or tending to be so; seeds brown.—Cedar Mt., Alameda Co., occupying a colony about 1½ by ¾ mile in area (Jepson 7741, type).

5. **C. fòrbesii** Jepson. Slender tree 15 to 20 ft. high; bark very smooth, shining, red-brown or even dark cherry red; branchlets squarish; foliage bright green; dorsal pits of leaves minute or commonly wanting; cones globose, ¾ to 1⅛ in. long; seed red-brown.—Mts. of San Diego Co.: Cedar Cañon betw. El Nido and Dulzura; Mt. Tecate; near Pala.

6. **C. nevadènsis** Abrams. Tree 20 to 50 ft. high; branchlets slender, 4-angled; leaves light green with conspicuous dorsal resin pit; cones oblong to subglobose, 10 to 12 lines long; upper umbos pointed; seeds light brown.—Local on Piute Mt., Kern Co.

7. **C. macnabiàna** Murr. MCNAB CYPRESS. Fig. 50 a, b. Tree 15 to 40 ft. high, often somewhat bushy, sometimes a low shrub; foliage blue-green, pungently aromatic; branchlets very slender; leaves with a conspicuous dorsal resin pit or white gland, often slightly glaucous; cones globose, 5 to 8 lines in diameter, reddish or grayish brown; umbos conical, the uppermost pair very prominent or horn-like and incurved; seeds brown.—Dry hills and flats, Napa Co. to Shasta Co., thence easterly to the n. Sierra foothills as far south as Yuba Co. Var. BÀKERI Jepson n. comb. Baker Cypress. Fig. 50c. Slender tree; cones silvery or glaucous; umbos short-conical.—Modoc lava beds. (C. bakeri Jepson.)

50. *a*, Cupressus macnabiana Murr., foliage branchlet x 6; *b*, cone x 1; *c*, var. bakeri Jepson, cone x 1.

5. JUNÍPERUS L. JUNIPER

Trees or shrubs. Leaves in whorls of 3 or opposite, scale-like, imbricated, closely appressed and adnate to the branchlets or linear-subulate and spreading. Stamens and ovules on separate trees. Staminate catkins with

many stamens, each with 2 to 6 anther cells. Ovulate catkins of 3 to 6 succulent coalescent scales, each bearing 1 or 2 ovules. Cones fleshy and berry-like, ripening the second year, in ours 1 to 3-seeded; cotyledons 2 to 6.

Catkins axillary; leaves linear or lanceolate, acute, cuspidate, spreading, white-glaucous above, 3 to 6 lines long; subalpine shrub.....1. *J. communis.*
Catkins terminal on short branchlets; leaves ovate, scale-like, ½ to 1 line long, closely appressed to the branchlets in whorls of 3, with a more or less distinct dorsal gland or pit.
Berries reddish brown, oblong; cotyledons 4 to 6; medium altitudes..2. *J. californica.*
Berries blue-black, globose or subglobose; cotyledons 2; high montane.....
3. *J. occidentalis.*

1. **J. commùnis** L. var. **montàna** Ait. DWARF JUNIPER. Low or prostrate alpine shrub, 1 ft. high or less, forming patches a few feet in diameter; leaves rigid, 3 (rarely 2) at a node with very short internodes; berries globose, blue, covered with white bloom, 1½ to 2½ lines long.—Sierra Nevada, 8000 to 9500 ft., from Mono Pass to Mt. Shasta, thence w. to Del Norte Co.; n. to Arctic regions; rare in Cal.

2. **J. califórnica** Carr. CALIFORNIA JUNIPER. Shrub, much-branched from the base, 2 to 15 ft. high, or occasionally a tree up to 40 ft. in height; bark brown or ashen gray, shreddy; berries subglobose or oblong, reddish or brownish, covered with a dense white bloom, 4 to 8 lines long, with dry fibrous sweet flesh and 1 to 3 seeds; seeds ovate, acute, brown, with a thick smooth but angled or ridged polished bony shell, 3 to 5½ lines long.—Western Mohave Desert, s. to L. Cal., n. in the Sierra Nevada foothills to Kern Co. and in the inner Coast Ranges to Mt. Diablo; local near Coulterville and in the mts. n. and w. of Clear Lake. Var. UTAHÉNSIS Engelm. Desert Juniper. Shrub 3 to 10 ft. high or a tree to 20 ft. high; branches more slender; leaves usually glandless; berries usually globose, blue-black with a bloom, 4 to 5 lines long.—Desert ranges, Inyo Co.; e. to Utah. (J. utahensis Lem.)

3. **J. occidentàlis** Hook. SIERRA JUNIPER. Subalpine tree 10 to 25 or even 65 ft. high; trunk 1 to 5 ft. in diameter; bark dull red, shreddy; berries globose to ovoid, blue-black with a whitish bloom, 3 to 5 lines long, with resinous juicy flesh and 2 seeds (rarely 1 or 3); seeds flat on the face, the convex back with 3 to 5 resinous-glandular pits.—Granite ridges and cirques, 7000 to 10,500 ft.: common in the Sierra Nevada, rare in the San Bernardino, Panamint and Yollo Bolly mountains; n. to Wash.

TAXÀCEAE. YEW FAMILY

Trees or shrubs with linear leaves 2-ranked by a twist in their petioles. Stamens and ovules borne on different trees. Stamens united by their filaments into a column with 4 to 8 pollen-sacs pendent from each filament. Ovule solitary, terminal on a short axillary branch. Seeds set loosely in a fleshy cup, or quite enveloped by it and thus appearing drupe-like, ripe in first autumn; cotyledons 2.

Fruit red, berry-like; leaves ⅛ to ⅔ in. long, acute.....1. TAXUS.
Fruit green or purplish, plum-like; leaves 1¼ to 2½ in. long, stiffish, bristle-pointed....
2. TORREYA.

1. TÁXUS L. YEW

Trees or shrubs, the leaves bluntish or merely acute. Stamens 7 to 12 in a cluster, the 4 to 9 pollen-sacs borne under a shield-like crest. Ovule seated upon a circular disk which in fruit becomes cup-shaped, fleshy, and red, surrounding the bony seed, the whole berry-like. (Ancient Latin name of the yew, probably from Greek toxon, a bow, the wood used for bows.)

1. **T. brevifòlia** Nutt. WESTERN YEW. Fig. 51. Small tree 10 to 30 ft. high, the crown irregular with the branches of unequal length and standing at various angles but tending to droop; bark thin, red-brown, shreddy; leaves linear, acute at apex, shortly petioled, flat, with midrib in relief above and below, 3 or mostly 6 to 8 lines long, 1 line wide, spreading right and left in flat sprays; seeds borne on the under side of the sprays and when mature set in a fleshy scarlet cup, the whole looking like a brilliantly colored

51. Taxus brevifolia Nutt.; *a*, fr. branchlet x ½; *b*, long. sect. fr. x ⅜.

berry.—Deep, shady cañons: Santa Cruz Mts. to Mendocino Co. and northw. to Mt. Shasta, thence s. through the Sierra Nevada. Localities few and scattered, and the individuals not numerous. Wood fine- and close-grained, hard, heavy and durable.

2. **TÓRREYA** Arn. Stinking Yew

Trees with rigid sharp-pointed leaves in 2 ranks. Stamen clusters solitary in the adjacent leaf axils, made up of 6 to 8 whorls of stamens, 4 stamens in a whorl, each filament with 4 pollen-sacs without crests. Ovule completely covered by a fleshy aril-like coat, the whole becoming drupe-like in fruit. Seed with thick, woody outer coat, its inner layer irregularly folded into the white endosperm; embryo minute. (John Torrey, Professor of Botany in Columbia College, long-time a student of western botany, who traveled in California before the days of the Overland Railroad.)

1. **T. californica** Torr. California Nutmeg. Fig. 52. Handsome tree 15 to 50 ft. high, the trunk ½ to 3 ft. in diameter; leaves rigid, 1¼ to 2½ in. long, 1½ lines wide, flat, dark green above, yellowish green beneath and with two longitudinal glaucous grooves, linear or tapering above middle, bristle-tipped, twisted on their short petioles so as to form a 2-ranked flat spray; fruit elliptical, green in color or when ripe streaked with purple, 1⅛ to 1¾ in. long; flesh thin and resinous; endosperm copious, with irregular incisions filled by the inner coat, giving it a marbled appearance so that in cross-section the seed resembles the true nutmeg of commerce.—Cool, shady cañons: Santa Cruz Mts. to Mendocino Co.; Sierra Nevada. A forestrally rare tree.

52. Torreya californica Torr.; fr. branchlet x ⅓.

GNETÀCEAE. Gnetum Family

Woody plants without resin. Catkins unisexual. Embryo axile in the endosperm; cotyledons always 2.

1. **ÉPHEDRA** L. Mexican Tea. Joint Pine

Equisetum-like shrubs with slender long-jointed stems, opposite or fascicled branches and opposite scale-like leaves. Scales more or less connate, sheathing the stem, at length splitting to the base. Staminate and ovulate catkins very small, on different shrubs. Staminate catkins with 2 to 8 stamens united into a column and a perianth of 2 segments. Ovulate catkins 1, 2, or usually 3 at each node, each 1 or 2-ovulate, with several subtending bracts. Ovule produced at apex into a style-like process (the micropyle) which is exserted through the opening in the urn-shaped perianth. Seed nut-like, enveloped by the indurated perianth, and partly or wholly enclosed by the bracts. (Greek ephedra, the name used by Pliny for the horse-tails.)

Scales and bracts in 2s; bracts connate at base; ovulate catkins (and sometimes the staminate) on peduncles ½ to 4 lines long.
Branches bright or yellowish green, erect and broom-like.....1. *E. viridis.*
Branches pale or glaucous, divergent.....2. *E. nevadensis.*
Scales and bracts in 3s; bracts distinct; ovulate catkins sessile or nearly so; branches clustered, erect.
Fruiting catkin subglobose, 3 to 4 lines long.....3. *E. californica.*
Fruiting catkin slender-ovate, 5 to 6 lines long.....4. *E. trifurca.*

1. **E. víridis** Cov. Erect green shrub 1½ to 3 ft. high, with numerous broom-like muriculate branches; fruiting bracts green, firm, with narrow scarious edge; fruits 1 or usually 2 in a catkin, with flat faces and strongly convex or carinate backs, 3½ to 4 lines long.—Desert ranges, 5000 to 7000 ft.: Mohave Desert; Inyo Co.; e. to Ariz. and Utah.

2. **E. nevadénsis** Wats. Erect olive-colored shrub ½ to 2 ft. high; branches somewhat scabrous, divergent; scales sheathing, at length mostly deciduous; fruiting bracts ovate or round ovate, firm, scarious on edges, 4 to 6 pairs; fruit one in a catkin, exserted, 3 or 4 lines long, 3-ridged or trigonous, or, when 2 in a catkin, with more or less flat faces and strongly convex or carinate backs.—Desert valleys: Honey Lake Valley s. to the Mohave and Colorado deserts; e. to Utah, s. to Mex.

3. **E. califórnica** Wats. Fig. 53. Light green shrub, 1½ to 3 ft. high; fruiting bracts reddish or brownish, submembranous, in 4 or 5 whorls, reniform-orbicular, entire, with a short broad claw; fruit one in a catkin, ovate, included, 4-angled, 2½ to 3 lines long.—Mohave and Colorado deserts, n. to western Fresno Co., w. to San Diego, s. to L. Cal.

4. **E. trifùrca** Torr. Erect light- or yellowish-green shrub 1½ to 5 ft. high, with spinosely tipped straight branches; scales conspicuously sheathing, 3 to 6 lines long, finally weathering fibrous; ovulate catkins nearly sessile, of 8 to 10 pairs of bracts; fruiting bracts large, very thin, scarious, round-cordate, clawed, with reddish centers; fruit one in a catkin, slender, 4-sided, included, 6 lines long.—Mohave River at Daggett; Superstition Mts., Colorado Desert; e. to Ariz., s. to Mex.

Class 2. ANGIOSPÉRMAE. Flowering Plants

Ovules enclosed in a sac or ovary, which becomes the fruit and encloses the seed. Plants with true flowers, typically with an abbreviated stem (receptacle) bearing regular whorls of floral envelopes and stamens and pistils.

MONOCOTYLEDONS

Leaves parallel-veined. Stem with vascular bundles scattered irregularly through the pith. Flowers with the parts usually in 3s. Embryo with one cotyledon.

TYPHÀCEAE. Cat-tail Family

Marsh or aquatic perennial herbs, the solid cylindric jointless stems from creeping rootstocks and bearing long linear alternate leaves. Flowers monoecious, crowded in dense cylindrical spikes, without perianth. Ovary 1-celled, 1-ovuled; style slender. Fruit a seed-like nutlet.

53. Ephedra californica Wats.; ovulate branchlet x 1.

1. TŸPHA L. Cat-tail

Stems tall, simple, ending above in a long spike, the pistillate portion below, the staminate portion above. Stamens seated directly on the axis, intermixed with long bristle-like hairs. Ovaries minute, pedicellate; pedicels bearing clavate bristles which envelop the very small nutlets in a copious down. (Ancient Greek name of the Cat-tail.)

Staminate and pistillate portions of spikes contiguous, rarely separated; pistillate flowers without bractlets.....1. *T. latifolia.*
Staminate and pistillate portions of spikes usually separated by a small interval; pistillate flowers with bractlets.....2. *T. angustifolia.*

1. **T. latifòlia** L. Common Cat-tail. Stout, 3½ to 6 ft. high; leaves very long, flat, sheathing at the base, ¼ to 1 in. broad; spike 7 to 13 in. long; pistillate portion of spike without bractlets; stigma rhombic-lanceolate; pollen-grains in 4s; fruiting spike dark brown or blackish, 10 to 12 lines thick.—Common in marshy places; north temperate regions.

2. **T. angustifòlia** L. Stems slender, 3 to 8 ft. high; leaves 3 to 6 lines broad, somewhat convex on the back; pistillate flowers with a hair-like bractlet dilated at apex and a linear stigma; pollen-grains simple; fruiting spikes light or dark brown, 5 to 6 lines thick.—Marshes: Inyo Co. s. to cismontane S. Cal.; Atlantic coast; S. Am., Eur., Asia, n. Afr.

SPARGANIÀCEAE. Bur-reed Family

Marsh or aquatic plants with terete stems from creeping rootstocks, alternate long-linear 2-ranked leaves and monoecious flowers in globose heads. Ovary 1 or 2-celled. Fruit consisting of obovoid or spindle-shaped nutlets, 1 to 2-seeded.

1. SPARGÀNIUM L. Bur-reed

Perennials with fibrous roots and horizontal rootstocks. Heads scattered along the upper portion of the simple or sparingly branched stem; lower heads pistillate, with leaf-like bracts; upper heads staminate. Stamens with minute scales interposed, their filaments slender and elongated. Ovaries surrounded by 3 to 6 linear-subulate scales forming a sort of calyx. (Sparganion, the Greek name, diminutive of sparganon, a swaddling-band, on account of the ribbon-like leaves.)

Inflorescence compound; pistillate flowers sessile; nutlets obovoid, with truncate or rounded summit; fruiting heads 10 to 15 lines in diameter.....1. *S. eurycarpum.*
Inflorescence simple; pistillate flowers pediceled; nutlets spindle-shaped, with tapering summit; fruiting heads 7 to 10 lines in diameter.
Leaves (2½ to 5 lines wide) and bracts conspicuously scarious-margined.....
2. *S. simplex.*
Leaves (1½ to 2 lines wide) and bracts not conspicuously scarious-margined.....
3. *S. angustifolium.*

54. Sparganium eurycarpum Engelm.; *a*, infl. x ¼; *b*, achene with sepals x 2; *c*, head of achenes x ¼.

1. **S. eurycárpum** Engelm. Fig. 54. Erect, rather slender, 3 to 8 ft. high, with branching inflorescence; leaves flat and thin, slightly keeled beneath; staminate heads 5 to 13; pistillate heads 2 to 4 on the stem or branch, sessile or more commonly peduncled; fruiting heads ¾ to 1¼ in. in diameter; nutlets sessile, obovoid, several-angled, with a truncate or depressed summit, tipped with the short style, 3 (or nearly 3) lines broad, 4 lines long, including the style.—Los Angeles River to the San Joaquin Valley; n. to B. C., e. to the Atlantic. Var. GRÈENEI Graebner. Branches of the inflorescence more erect; achenes rounded at summit.—San Francisco Bay region, s. to L. Cal., n. to B. C.

2. **S. símplex** Huds. Fig. 55. Stems erect, 1 to 3 ft. high, or sometimes floating; leaves 2 to 6 lines broad, slightly carinate; inflorescence usually simple; staminate heads 3 to 5, congested or confluent, but distant from the pistillate; pistillate heads 2 to 6, the lowest peduncled, some supra-axillary, 8 or 9 lines in diameter in fruit; nutlets narrow, 2 to 2½ lines long, 1 to 1½ lines thick on the lower third, at apex gradually attenuate into the long style, long-pediceled, often 2-celled.—Sierra Nevada, 6000 to 7000 ft., from Tulare Co. to Modoc Co.; n. to B. C., e. to N. Eng.

55. Sparganium simplex Huds.; *a*, fr. branch x ½; *b*, achene x 2.

3. **S. angustifòlium** Michx. Stems 1 to 4 ft. high; leaves exceedingly long and narrow, 1 to 2½ lines

broad, floating or erect; inflorescence simple; staminate heads 2 to 6, sometimes blended but distant from the pistillate; pistillate heads sessile in the axils, often a little supra-axillary, rarely peduncled; nutlets 2½ lines long, brownish, constricted at or above the middle, abruptly contracted at apex into the long style or beak, pediceled.—Lakelets and slow streams, 8000 to 9000 ft., very rare: San Bernardino Mts.; Sierra Nevada; B. C. to the Atlantic.

NAIADÀCEAE. Pondweed Family

Water plants entirely submerged or with floating leaves. Leaves thread-like or grass-like or some with broad floating blades, commonly sheathing at base or with sheathing stipules. Flowers inconspicuous, naked or with a very small calyx, commonly borne on a short spike or spadix. Ovaries 1 to 4, distinct, free from the calyx if that be present, 1-celled, 1-ovuled, ripening into nutlet-like fruits.

Flowers perfect, in spikes or clusters.
  Calyx of 4 distinct sepals.....1. Potamogeton.
  Calyx none.....2. Ruppia.
Flowers unisexual; calyx none.
  Leaves entire.
    Pistils about 4, borne in a cup-shaped involucre; fresh water ponds or streams..
      3. Zannichellia.
    Pistils many, borne on the side of a linear spadix; maritime.
      Flowers monoecious; nutlet ovoid; leaves 2 to 4 lines broad....4. Zostera.
      Flowers dioecious; nutlet sagittate-cordate; leaves ½ to 2 lines broad.....
        5. Phyllospadix.
  Leaves with spiny-toothed margins; pistil solitary and naked.....6. Naias.

1. PÓTAMOGÈTON L. Pondweed

Perennial herbs, commonly growing in the still waters of creeks and in fresh or brackish ponds, the stems arising from rootstocks. Leaves alternate, or the uppermost opposite, frequently of two kinds, the floating ones broad, the submerged narrower and often thread-like or linear; stipules present, often sheathing the stem. Flowers in spikes or heads on axillary peduncles and enclosed in the bud by stipular sheaths. Sepals 4, with short claws. Stamens 4, inserted on the base of sepals. Ovaries 4. (Greek potamos, a river, and geiton, a neighbor, on account of the aquatic habit.)

A. Stipules axillary and free from the leaf.

Plants with both submerged and floating leaves; petioles of floating leaves present, often long, short or none in no. 4.
  Submerged leaves linear or thread-like, consisting of petioles only.
    Floating leaves elliptical, subcordate at base.....1. *P. natans.*
    Floating leaves narrowly oblong, attenuate into the petiole.....2. *P. epihydrus.*
  Submerged leaves linear or lanceolate, bearing true blades.
    Flowers capitate; peduncles 1 to 3 lines long; floating leaves less than 1 in. long.
      3. *P. dimorphus.*
    Flowers spicate; peduncles 2 in. long or more; floating leaves 2 to 4 in. long.
      Plants reddish; nutlet with a distinct pit on each side.....4. *P. alpinus.*
      Plants green; nutlet not pitted.
        Nutlet distinctly 3-keeled; low altitudes.....5. *P. americanus.*
        Nutlet indistinctly 3-keeled; high montane.....6. *P. heterophyllus.*
  Submerged leaves, or some of them, broader and falcate.....7. *P. amplifolius.*
Plants with the leaves all submerged; petioles short or none.
  Leaves with broad blades, ovate, orbicular or lanceolate, never linear.
    Stipules greenish; leaves with a short petiole or subsessile.....8. *P. lucens.*
    Stipules white, with numerous fibrous nerves.
      Leaves clasping, hooded at apex; peduncles often 8 in. long or more.....
        9. *P. praelongus.*
      Leaves cordate-clasping, not hooded, the lobes at base often touching around the stem.....10. *P. perfoliatus.*
  Leaves linear, thread-like, or setaceous.
    Without propagating buds or glands.....11. *P. foliosus.*
    With both propagating buds and glands.
      Leaves capillary; stem slender, not flattened.....12. *P. pusillus.*
      Leaves linear, 1 to 2 lines wide; stem much flattened....13. *P. compressus.*

B. Stipules adnate to the leaf or petiole.

Plants with submerged leaves only.
  Leaves capillary.....14. *P. pectinatus.*
  Leaves flat, ½ to 1½ lines broad.
    Leaves in terminal clusters.....15. *P. latifolius.*
    Leaves 2-ranked.....16. *P. robbinsii.*

1. **P. nàtans** L. Broad Pondweed. Stem thick, little if at all branched; floating leaves elliptical, subcordate at base, 1½ to 3 in. long, 1 to 2 in. broad, on petioles longer than the blade; stipules linear-lanceolate, membranaceous, 2 to 4 in. long; submerged leaves consisting of petioles without blades, 2 to 9 in. long or more and 1 line wide, usually perishing early, their tips sometimes reaching the surface of the water and forming miniature blades; spikes dense, 1 or 2 in. long, on longer peduncles; nutlet evidently keeled along the back, 2 lines long.—Montane region at 5000 to 7000 ft, alt.: Bear Valley, San Bernardino Mts.; Sierra Nevada; Mt. Shasta; n. to B. C., e. to the Atlantic; Eur., Asia.

2. **P. epihỳdrus** Raf. Stems slender (½ line broad), compressed, mostly simple, 1 to 2 ft. long; floating leaves narrowly oblong, 1¾ to 2 in. long, gradually narrowed into petioles about ½ as long; submerged leaves thin, grass-like, 2 to 3 in. long, 2 to 3 lines wide, the petiole-like base very short; spikes dense, ½ in. long, on peduncles 1¼ to 1½ in. long; nutlet flattish, 3-keeled, the seed impressed on the sides.—Yosemite Valley; n. to B. C., e. to the Atlantic.

3. **P. dimórphus** Raf. Stems simple, 1½ ft. long; floating leaves in 2 or 3 opposite pairs, oblong, tapering to each end, impressed beneath with 7 to 9 nerves, 3 to 4 lines wide and 7 to 10 lines long, passing rather definitely at base into the somewhat shorter (or sometimes longer) petiole; submerged leaves ¼ to ¾ line wide, 1 or 2 in. long, acute at tip but not setaceous, stipules 1 to 5 lines long, adnate for about ½ their length; flowers in a few-flowered head (or the emersed in a very short spike), the peduncles 1 to 3 lines long, shorter than the submersed spike; nutlet less than 1 line long, keeled on the back, the keel winged and sometimes denticulate; embryo coiled 1⅓ times; pericarp very thin and fleshless, revealing clearly the coiled embryo, the whole suggestive of a snail shell.—San Jacinto Mts.; n. to the Great Valley; e. to Va.

4. **P. alpìnus** Balbis. Alpine Pondweed. Whole plant of a reddish tinge; stems simple, 1 or 2 ft. long; floating leaves narrowly oblong, tapering at both ends, 2 to 4 in. long, ⅛ to ¾ in. wide, submerged leaves 2 to 7 in. long, ¼ to ½ in. wide, all sessile or narrowed to a short petiole; stipules broad, ½ to 1¼ in. long; spikes ⅜ to 1⅛ in. long, on peduncles about 2 in. long; nutlet with a distinct pit on each side.—Ponds, montane, 6000 to 7000 ft.: Sierra Nevada, from Fresno Co. to Alpine Co.; n. to Alas. and Canada, e. to Fla.; Eur., Asia.

5. **P. americànus** C. & S. Stems terete, much branched, 3 to 6 ft. long; floating leaves coriaceous, elliptical, 2 to 4 in. long, ½ to 1½ in. wide, the petiole often longer than the blade, submerged leaves very thin, lanceolate, 4 to 12 in. long, 4 to 6 lines broad, rounded at base, or tapering into a petiole 1 to 4 in. long; stipules 1 to 4 in. long; peduncles 2 to 3 in. long; spikes 1 to 2 in. long, densely fruited; nutlet obliquely obovate, 1½ to 2 lines long, the back 3-keeled, with the middle keel prominent.—Ponds or slow creeks in the valleys or hills at low altitudes: Los Angeles Co.; Great Valley; Coast Ranges; n. to B. C., e. to the Atlantic; Eur., Asia, n. Afr.

6. **P. héterophýllus** Schreb. Stems slender, compressed, branched, 1 to 2 ft. long; floating leaves oval to oblong-elliptical, 1 or 2 in. long, 4 to 9 lines wide; petioles 1 to 4 in. long; stipules 1 in. long or less; submerged leaves linear-lanceolate, narrowed at base, sessile, 1 to 2 in. long, 1 to 3 lines wide; spikes 1 in. long; peduncles 1 to 4 in. long; nutlet roundish, ¾ to 1½ lines long, indistinctly 3-keeled.—High montane, 8000 to 9000 ft.: Sierra Nevada from Tulare Co. to Modoc Co.; n. to Wash., e. to the Atlantic; Eur., Asia.

7. **P. amplifòlius** Tuckerm. Stems mostly simple, 2 to 4 ft. long; floating leaves oblong-ovate or oval, mucronate, ¾ to 1¼ in. broad, 2 to 3 in. long, the petioles of about the same length; submerged leaves with the sides folding together and assuming a falcate shape, the uppermost large, elliptical or ovate, 2½ to 4 in. long, the lower lanceolate and often as much as 8 in. long and 2 in. wide; spikes ½ to 2 in. long; peduncles thickening upwards.

2 to 3 in. long; nutlet 3-keeled, the middle keel prominent.—Sierra Nevada (Red Lake on the San Joaquin River); Ore. and B. C. to the Atlantic.

8. **P. lùcens** L. Stem thick, branching below and bearing masses of very leafy branches at summit; leaves all submerged, thin, elliptical to lanceolate or oblanceolate or the uppermost oval, acute or acuminate, often undulate-serrate, narrowed at base to a short petiole or sessile, 2 to 7 in. long and ¾ to 1¾ in. wide; stipules greenish, 1 to 2 in. long, loose and spreading, sometimes very broad; peduncles 3 to 6 in. long; spikes 2 to 2½ in. long, thick cylindrical; nutlet 1½ lines long, nearly as broad, with 3 distinct ribs on back.—Small lakes and ponds: San Diego Co.; San Francisco; n. to B. C., e. to Nova Scotia.

9. **P. praelóngus** Wulf. Stems whitish, zigzag, 3 to 8 ft. long, branching; leaves all submerged, bright green, oblong-lanceolate, undulate, "cucullate at apex," sessile by a clasping base, 4 to 9 in. long, and ½ to 1 in. wide; stipules white, the uppermost obtuse, many-nerved, usually hugging the stem, ¾ to 1½ in. long; spikes 1 to 2 in. long, borne on peduncles 4 to 10 in. long (or even longer), erect and straight and often numerous; nutlet 2 to 2½ lines long.—Deep water of ponds: Sierra Co.; Ore. to B. C. and N. J.; Eur.

10. **P. perfoliàtus** L. var. **richardsònii** Benn. Stems straight, simple or branching; leaves long-lanceolate and acute, wavy, cordate at base and clasping, 1 to 4 in. long; stipules ½ to ¾ in. long, many nerved, often becoming much frayed; spikes 8 to 11 lines long; peduncles 1¼ in. long; nutlet 1¾ lines long.—Siskiyou Co.; Ore. to B. C. and N. J.

11. **P. foliòsus** Raf. Leafy Pondweed. Stem flattened, much branched, 1 to 2½ ft. high; leaves rather thickly clothing the stem, 1 to 1½ in. long, ½ to 1 line wide, abruptly acute; stipules white, transparent, 6 to 9 lines long; flowers few in a head on a peduncle 2 to 6 lines long; nutlet nearly 1 line long, 3-keeled on the back, the central keel with narrow rough-edged wing.—Ponds, Coast Ranges and Sierra foothills; n. to Ore., e. to the Atlantic. Var. CALIFÓRNICUS Morong. Bushy in its habit; stem thick.—Coastal S. Cal. Var. NIAGARÉNSIS Gray. Large-sized; leaves often 3 in. long or more; stipules longer than in the species.—Visalia; e. U. S.

12. **P. pusíllus** L. Slender Pondweed. Stems filiform, branching, ½ to 1 ft. long; leaves narrowly linear, acute, with a crater-like gland on each side of the stem at base of the petiole or rarely glandless, 1 to 3 in. long, ¼ to ¾ line wide, sessile; stipules short, obtuse, becoming setose; peduncles flattened, slender, ½ to 3 in. long; spikes interrupted or capitate; nutlet obliquely elliptical, ¾ to 1 line long, with a groove on each side of the rounded back, or sometimes with 3 distinct keels, beaked by a short style.—Coast Ranges; Sierra Nevada; n. to B. C., e. to the Atlantic, s. to Mex.; Eur., Asia. Var. TENUÍSSIMUS Mert. & Koch. Leaves setaceous.—Soda Sprs., Tuolumne Mdws.

13. **P. compréssus** L. Eel-grass Pondweed. Stem very much flattened; foliage bright green and shining; leaves fascicled at summit of the branches, with numerous fine nerves, 2 to 6 in. long, 1¼ to 2 lines wide, abruptly acute, mucronate, sessile; stipules scarious, soon perishing; spikes ½ to 1 in. long, on peduncles 1 to 4 in. long; nutlet nearly or quite 2 lines long, 3-keeled on back.—Honey Lake Valley, Lassen Co.; Ore. to B. C. and N. J.; Eur.

14. **P. pectinàtus** L. Fennel Pondweed. Sago Pondweed. Fig. 56. Stems ½ or 2 to 6 or 8 ft. long, from a running rootsock, repeatedly forking above, then very leafy and forming broom-like clusters; leaves very slender, setaceous, 1 to 3 in. long exclusive of the sheaths which are ½ to ¾ in. long or on the lower leaves even 2 in. long; scarious margin of the sheaths very narrow; spikes ½ to 1½ in. long, the flowers in distinctly separated whorls; peduncles 1 to 3 or more in. long; nutlet 1½ to 2 lines long, with an obscure ridge on each side of the back.—The most common species throughout the state from sea-level to 7000 ft.; of world-wide distribution. The rootstocks bear tubers about the size of a pea, which are fed upon by the Canvas-back and Broad-bill.

56. Potamogeton pectinatus L.; *a*, fruiting branch; *b*, rootstocks with ascending stems producing tubers on branches from the nodes; *c*, *d*, tubers with young shoots. x ¼.

15. **P. latifòlius** Morong. Near the preceding; stems stoutish, white, branching; leaves numerous, fascicled terminally, ½ to 1½ lines broad; adnate portion of stipule ¼ to 1 in. long, broad on the uppermost leaves, scarious-margined, the free portion shorter.—Brackish water; n. Sierra Nevada from Lassen Co. to Modoc Co.; nw. Nev.

16. **P. robbínsii** Oakes. Stems stout; rootstocks running, sometimes nearly 1 ft. long; leaves crowded in 2 ranks, 1½ to 4 in. long, 1½ to 2 lines wide, obtuse, mucronate, auriculate at junction of free portion of stipule; adnate portion of stipules about ½ in. long, the free portion as long or longer.—Mariposa Co.; Honey Lake Valley, Lassen Co.; Ore. to B. C. and Del.

2. RÚPPIA L.

Immersed aquatic herbs with long filiform forking stems. Leaves almost capillary, with a broad membranous sheathing base. Peduncles slender, axillary, at first very short and enclosed in the spathe-like base of the leaf, each bearing two flowers disposed near together and rising to the surface in the period of anthesis, afterwards coiling and drawing the fruits beneath the surface. Flowers perfect, entirely destitute of perianth. Stamens 2, sessile, each anther consisting of 2 large and separate anther-cells. Pistils 4, after flowering becoming stalked and ripening into hard ovoid nutlets; stigmas depressed, sessile. (H. B. Ruppius, a German botanist of the 18th century.)

1. **R. marítima** L. Ditch-grass. Plants 2 to 3 ft. long; leaves 2 to 3 in. long; nutlets ¾ to 1¼ lines long, raised on stipes 1 to 12 lines long; fruiting peduncle 3 to 6 lines long.—Alkaline or brackish waters: throughout the state; cosmopolitan.

3. ZANNICHÉLLIA Mich.

Immersed aquatic plants, flowering and fruiting under water, the thread-like stems from a creeping rootstock. Leaves opposite or in whorls. Flowers monoecious, without perianth, sessile, both kinds in the same axil: staminate flowers consisting of an anther on a pedicel-like filament; pistillate flowers 2 to 6 (usually 4) in a cluster and surrounded by a hyaline cup-shaped involucre shorter than the pistils, each flower consisting of a single pistil with a thin peltate stigma on the summit of the short style. Fruit an oblong somewhat flattened, beaked nutlet. (G. G. Zannichelli, 1662-1729, a botanist of Venice.)

1. **Z. palústris** L. Horned Pondweed. Stems sparingly branched, 1 to 1½ ft. long; leaves 1 to 2 in. long, filiform but flat; nutlet slightly incurved, becoming stipitate, 1 to 1½ lines long, often roughened or toothed on the back.—Pools and still waters of streams: Los Angeles and Santa Barbara, n. to Alameda Co. and the Sacramento Valley; cosmopolitan.

4. ZOSTÈRA L. Grass-wrack

Submerged maritime herbs with elongated and very narrow grass-like radical leaves and inflorescences raised on peduncle-like stems. Flowers monoe-

cious, borne in 2 rows on the face of a flattened spadix with or without small lateral appendages covering them in the bud and closely invested by a protecting leaf-like spathe until anthesis. Staminate flower of 1 stamen. Pistillate flower of 1 pistil. Nutlet ovoid. (Greek zoster, a girdle or band, on account of the ribbon-like leaves.)

1. **Z. marina** L. EEL-GRASS. Leaves with long sheathing bases, 3 to 7-nerved, 1 to 4 ft. long, 1 to 4 lines broad; spathes jointed at base, ending above in a more or less elongated leaf-like summit; spadix 2 to 4 in. long, 10 to 20-fruited; fruits 1½ lines long, the ribs of the seed showing clearly on the pericarp.—Shoal waters of bays, San Pedro to San Francisco Bay and n. to Alas. Var. LATIFÓLIA Morong. Stem stout, sometimes 8 or 10 ft. long; leaves 3 to 6 lines wide; nutlet with a distinct stipe, the pericarp splitting along the face; seed without ribs.—Santa Barbara to Bolinas Bay and n. to Puget Sound.

5. **PHYLLÓSPADIX** Hook.

Aquatic plants of rocky ocean shores, closely related to Zostera, with elongated narrowly linear basal leaves from much branched creeping rootstocks. Flowers dioecious, borne in 2 rows on the side of a flattened spadix, with a lateral chartaceous appendage covering each flower in the bud, the whole inflorescence enclosed by a spathe which is produced beyond the spadix as a foliaceous prolongation. Staminate spadices with sessile anthers; pistils or rudiments none. Pistillate spadices with rudimentary anthers alternating with the pistils; pistils simple, with 2 stigmas; ovary sagittate-cordate, i. e., with two downwardly-produced horns at base, which in fruit are strongly developed and bear on the inside deflexed bristles serving to attach the floating nutlets to other plants on the beaches. (Greek phullon, leaf, and spadix, a kind of inflorescence.)

Flowering stems 1 ft. long or more, bearing 2 to 5 pistillate spadices.....1. *P. torreyi.*
Flowering stems 2 or 3 in. long, bearing 1 pistillate spadix or rarely 2.....2. *P. scouleri.*

1. **P. tórreyi** Wats. Rootstocks brittle; leaves 1½ to 2 ft. long, ½ to 1 line broad; pistillate spadices 1 to 1¾ in. long; staminate spadices shorter and with shorter peduncles; nutlet 2½ lines long.—Low tide limits to two fathoms below: Russian River to San Diego; s. to L. Cal.; usually in more quiet waters than the next.

2. **P. scoùleri** Hook. Very similar to the preceding but the leaves rather broader, ¾ to 2 lines wide, and more obviously 3-nerved; nutlet larger.—Santa Barbara to Sonoma Co.; n. to Vancouver Isl.; Japan.

6. **NÀIAS** L. NAIAD

Slender branching submerged fresh-water plants with linear opposite spiny-toothed leaves, which are seemingly whorled on account of the ones crowded in the axils. Flowers monoecious or dioecious, solitary in the axils. Staminate flower consisting of a single stamen enclosed by two perianth-like envelopes. Pistillate flower naked, consisting of a single ovary bearing a style with 2 to 4 stigmas. Fruit a seed-like nutlet, tipped with the persistent style. (Greek Naias, a water-nymph.)

Leaves coarsely toothed, the sheathing base entire or with 1 or 2 teeth on each side; stems and back of the leaves often spiny; flowers dioecious.....1. *N. marina.*
Leaves very minutely serrulate; flowers monoecious; stems unarmed.
Nutlet shining, smooth; sheathing base of leaves with many minute teeth on its upper portion.....2. *N. flexilis.*
Nutlet dull, reticulated; sheathing base of leaves commonly narrow and with few teeth or sometimes entire.....3. *N. guadalupensis.*

1. **N. marina** L. HOLLY-LEAVED NAIAD. Stems stout, often armed with prickles twice as long as their breadth; leaves linear, ¾ to 1½ in. long, 1 to 1½ lines broad, coarsely saw-toothed, with the teeth spinulose-tipped and the broad sheathing base entire or with 1 or 2 teeth on each side; nutlet 2 to 2½ lines long, reticulated.—Clear Lake; L. Cal.; e. to the Atlantic. Rare in Am.; Eur., Asia, Australia. Var. CALIFÓRNICA Rendle. Internodes sparingly spinose; leaves very coarsely toothed and with 4 to 6 dorsal spines.—S. Cal.

2. **N. flexilis** R. & S. Slender Naiad. Stems slender; leaves narrowly linear, very minutely toothed, mostly acuminate, ½ to 1 in. long, ¼ to ½ line wide; nutlet oblong-ovoid, 1 to 2 lines long, nearly smooth, shining.—Santa Monica; San Francisco; Wash. to the Atlantic; Eur.

3. **N. guadalupensis** (Spreng.) Morong. Stems thread-like, 1 to 2 ft. long; leaves 6 to 9 lines long, ½ line wide or something less, abruptly acute; nutlet cylindrical, 1 to 1½ lines long, dull but distinctly marked with numerous rows of squarish reticulations.—Ore. to San Francisco and se. to the Atlantic; tropical Am.

JUNCAGINÀCEAE. Arrow-grass Family

Marsh or sub-aquatic herbs with mostly basal rush-like or grass-like leaves, and small flowers in racemes or spikes, or solitary. Calyx 6 or 3-parted, or none. Stamens in ours 6 or 1. Ovaries 1, or 3 to 6 and united. Embryo straight.

Flowers perfect, in a raceme; perianth present; stamens 6 or 3.
Leaves all basal; flowers greenish, numerous in bractless spike-like racemes..... 1. Triglochin.
Leaves both basal and cauline; flowers white, few in a loose bracted raceme..... 2. Scheuchzeria.
Flowers polygamous, in a spike, also with some solitary; perianth none; stamen 1..... 3. Lilaea.

1. TRIGLÒCHIN L.

Perennial by means of short rootstocks. Leaves fleshy with membranous sheaths. Flowers small, in a spike-like bractless raceme raised on a scape. Sepals 6 or 3, greenish, deciduous, the 3 inner inserted higher. Stamens 6 or 3; anthers sessile or nearly so. Carpels 6 or 3, united around a central axis (carpophore), separating when ripe from the base upward, and leaving the persistent axis. Stigmas as many as the carpels, plumose. Carpels 1-seeded, dehiscing by the ventral suture. (Greek tri, three, and glochis, a point, referring to the fruit of the 3-carpeled species.)

Sepals 6, the 3 inner inserted higher; carpels 6, strongly 2-ridged, with an obscure or obvious ridge in the furrow; carpophore slender, not winged.....1. *T. maritima.*
Sepals 3; carpels 3, 3-ridged, the median ridge much stronger than the lateral; carpophore 3-winged.....2. *T. striata.*

1. **T. maritima** L. Common Arrow-grass. Scapes stout, 1 ft. long or somewhat more, bearing a raceme 10 to 15 in. long, the whole surpassing the (2 to 3 lines wide) leaves; flowers 1 line long, longer than the pedicels, these in fruit conspicuously decurrent; carpels 3-angled, with the dorsal angles winged, making a broad longitudinally-striate groove on the back, 2½ lines long.—Marshy shores along the coast, rarely in the interior. Var. débilis Jones Slender Arrow-grass. Scapes very slender and racemes looser, 7 to 13 in. high; leaves usually less than 1 line wide; flowers about ½ line long; carpels rather less than 2 lines long; fruiting pedicels less obviously decurrent.—With the species.

2. **T. striàta** R. & P. Scapes 1 to several in a tuft, 2 to 7 in. high, mostly exceeded by the leaves; leaves 1 line wide; sepals 3; stamens 3; fruit about ¾ line long; carpels 3-ridged on the back.—Salt-marshes, Coast Ranges from Monterey Co. to Mendocino Co.; N. and S. Am.

2. SCHEUCHZÈRIA L.

Rush-like perennials with creeping rootstocks, erect leafy zig-zag stems, and small flowers in a loose terminal raceme. Leaves grass-like, flat above, semi-terete below, tubular at apex, sheathing the stem at base, reduced to bracts above. Flowers white, few in a lax raceme. Calyx 6-parted, persistent, its segments nearly alike, the inner narrower. Stamens 6, inserted on the base of the perianth segments. Ovaries 3, nearly distinct, 1 to 3-ovuled, bearing flat sessile stigmas, becoming in fruit divergent inflated coriaceous follicles dehiscent along the inside. (The brothers J. and J. J. Scheuchzer, Swiss botanists, early in 18th century.)

1. **S. palústris** L. Stems solitary or several, 4 to 10 in. high; leaves 4 to 12 in. long; pedicels 3 to 10 lines long, spreading in fruit; perianth segments

membranous, 1-nerved, 1½ lines long; follicles 2 to 4 lines long.—Bogs: Sierra Co.; n. to Alas., e. to Penn.; Eur., Asia.

3. LILAÈA H. & B.

Sub-aquatic annual with fibrous roots and basal rush-like leaves sheathing at base. Flowers in spikes raised on scapes and also with solitary pistillate flowers in the axils of the basal leaves. Spikes unisexual or with perfect flowers in the middle, pistillate below and staminate above, all in the axils of bracts except the pistillate. Staminate flowers consisting of a single stamen. Perfect flowers made up of a stamen and a pistil. Pistillate flowers consisting of a single pistil with short style, those in the axils of the basal leaves with extraordinarily long styles. Fruits coriaceous, flattish, oblong-ovate, winged, longitudinally ribbed, 1-seeded, indehiscent, those in the axils of the basal leaves less compressed and wingless. (A. R. Delile, French botanist, 1778-1850, author of a Flora of Egypt.)

1. **L. subulàta** H. & B. Leaves cylindrical, 6 to 8 in. long, 1 to 2 lines in diameter, tapering to a point; spikes dense, ½ in. long or less; basal pistillate flowers often with a style 1 to 3 in. long, their fruits larger than those of the spike, 2½ to 3 lines long.—In water or mud of shallow vernal pools, Great Valley and Coast Ranges, s. to S. Cal.; n. to B. C.; also Mex. and S. Am.

ALISMÀCEAE. Water Plantain Family

Marsh or aquatic herbs with basal leaves, scape-like flower stems and perfect or unisexual flowers. Perianth of 3 outer herbaceous persistent sepals and 3 inner white delicate deciduous petals. Stamens 6 to many or numerous. Ovaries numerous, distinct, 1-celled, 1-ovuled, becoming achenes in fruit. Endosperm none; embryo strongly recurved or folded.

Achenes verticillate in a single whorl; stamens 6.
- Petals entire; style lateral; achenes minutely beaked ..... 1. Alisma.
- Petals incised; style apical; achenes long-beaked ..... 2. Damasonium.

Achenes numerous, crowded on a globose or elevated receptacle; stamens 9 to many.
- Leaves entire; achenes turgid; flowers all perfect ..... 3. Echinodorus.
- Leaves typically sagittate; achenes strongly flattened; flowers not all perfect.
  - Flowers polygamous, the lower perfect, the upper staminate .. 4. Lophotocarpus.
  - Flowers unisexual, the lower pistillate, the upper staminate ..... 5. Sagittaria.

1. ALÍSMA L.

Erect perennial herbs of shallow water or mud. Inflorescence a panicle of whorled branches each bearing a simple or compound umbel of perfect flowers. Petals small, scarcely exceeding the sepals. Stamens 6, with short filaments. Ovaries distinct, on a disk-like receptacle. Achenes numerous, channeled on the back, crowded in a whorl. (Alisma, the Greek name.)

1. **A. plantàgo** L. Water Plantain. Fig. 57. Plants 2 to 4 (or 6) ft. high; rootstock becoming almost bulbous by the sheathing bases of the petioles; leaf-blades ovate to oblong, abruptly acute, the larger often subcordate at base, 2 to 6 (or 9) in. long, usually on long petioles; whorled branches of flowering stems unequal in length, forming a loose pyramidal panicle; pedicels 1 in. long or less;

57. Alisma plantago L.; *a*, fr. plant x ¼; *b*, fr. head x 3; *c*, achene x 3.

petals white, 1 line long; achenes very strongly flattened, oblong, 1 line long. —Common along the margins of ponds, rivers, and marshy shores of lakes: Coast Ranges; Great Valley; Sierra Nevada to 5000 ft. Widely distributed as a polymorphic species, through the north temperate zone and in n. Afr. and Australia.

2. DAMASÒNIUM Juss.

Annual or perennial herbs. Flowers perfect, in a terminal umbel, or the umbel proliferous and forming a succession of 2 or 3 umbels. Petals delicate, spreading, erose or incised, soon marcescent. Stamens 6, in pairs opposite each sepal. Ovaries 6 to 10, 1 to several-ovuled, attached by their short ventral side to the conical receptacle. Achenes with long erect beak, radiately whorled and divergent. (Name of uncertain origin.)

58. Damasonium californicum Torr.; *a*, fr. infl. x ½; *b*, leaf x ½; *c*, achene x 2½.

1. **D. califórnicum** Torr. Fig. 58. Stems erect, slender, 8 to 16 in. high, arising from tuberous perennial rootstocks; leaf-blades ovate to lanceolate, 3 to 5-nerved, 1 to 1½ in. long, long-petioled; petals almost orbicular, 4 to 5 lines long, larger than the sepals; ovaries 1-ovuled; achenes ribbed on back, 3½ lines long, their beaks long-subulate.—Pools and shallow shores: Petaluma; College City; Sutter Co.; n. Sierra Nevada from Amador Co. to Modoc Co.

3. ECHINÓDORUS Rich.

Annual or perennial herbs with the habit of Sagittaria. Stem scapose, with the perfect flowers on short pedicels in umbel-like whorls. Stamens 6 to 12 or more. Ovaries 1-ovuled, many to numerous, crowded on a globose receptacle, attenuate into the terminal style. Achenes sharply ribbed. (Greek echinos, hedgehog, and doros, utricle, or leather bottle, in reference to the prickly fruit.)

1. **E. cordifòlius** (L.) Griseb. Fig. 59. Annual; leaf-blades ovate, 5 to 9-nerved, obtuse, truncate or cordate at base, 1½ to 6 (or 8) in. long, long-petioled; scapes erect, 1¼ to 2 ft. high; umbels distant, 3 to 12-flowered, proliferous and forming a sparingly branched panicle; corolla 6 to 14 lines broad; stamens 12; fruiting heads globose-ovate, 3 lines long; achenes 1 line long, strongly several-ribbed, with a conspicuous erect straight beak.—**Borders of pools and streams: San Joaquin Co.; cismontane S. Cal.; Palo Verde Valley; e. to Fla.; s. to Mex.**

59. Echinodorus cordifolius Griseb.; *a*, habit x ½; *b*, leaf x ½; *c*, fl. x ½; *d*, achene x 4.

4. LÓPHOTOCÁRPUS T. Dur.

Closely allied to Sagittaria. Leaves sagittate, sometimes with entire blades or reduced to phyllodes. Flowers polygamous (perfect and staminate). Sepals accrescent, erect and appressed in fruit. Stamens 9 to 21. Fruiting pedicels recurved. (Greek lophos, crest, and karpos, fruit.)

1. **L. calýcinus** (Engelm.) J. G. Sm. Aquatic; leaves submerged, floating or erect; scapes simple, bearing 3 to 5 whorls of flowers.—Stockton; Los Angeles Co.; e. to the Atlantic.

5. SAGITTÀRIA L. Arrow-head

Marsh or aquatic perennial herbs with thickened or tuberous rootstocks, fibrous roots and milky juice. Leaves sheathing the stem at base; earlier leaves (phyllodia) destitute of blades, later producing small entire blades or most commonly sagittate blades. Flowers pediceled, borne in whorls of 3 on the upper part of the stem, with membranous bracts. Flowers monoecious (rarely dioecious), the staminate above. Petals longer than the sepals. Stamens numerous, inserted above the receptacle. Ovaries indefinitely numerous, crowded on a globose receptacle. Achenes flat, winged or margined, beaked by the short style. (Latin sagitta, an arrow, referring to the shape of the leaves.)

Sepals of pistillate flowers reflexed or spreading, not accrescent.
- Pedicels of pistillate flowers slender, ascending; leaves (or some of them) with sagittate lobes.
  - Basal lobes equaling or shorter than the terminal one; achenes without wings or crests on sides.
    - Achenes with prominent horizontally oblique beak.....1. *S. latifolia.*
    - Achenes with minute erect beak.....2. *S. arifolia.*
  - Basal lobes longer than terminal one; achenes almost beakless, the sides with a prominent wing-margined depression.....3. *S. greggii.*
- Pedicels of pistillate flowers much thickened, reflexed in fruit; leaves not sagittate... 4. *S. sanfordii.*

Sepals of the pistillate flowers erect and accrescent.....5. *S. montevidensis.*

1. **S. latifòlia** Willd. Tule Potato. Leaf-blades sagittate, very variable in outline and size, 2 to 12 in. long; basal lobes lanceolate to broadly ovate, acuminate, commonly divaricate, ½ to as long as the terminal lobe; scape simple or branched, ¼ to 3 ft. high; flowers monoecious or dioecious; stamens 20 to 25; achene 1½ lines long, with somewhat swollen dorsal wing and long horizontally oblique beak.—Rivers and deltas of the Sacramento and San Joaquin valleys, especially abundant on the river islands; swamps and meadows in the Sierra Nevada to 6000 ft.; s. to Los Angeles. Almost throughout N. Am. The edible tubers are used by the Chinese of the lower Sacramento.

2. **S. arifòlia** Nutt. Very near the preceding; leaf-blades sagittate, 2½ to 7 in. long; terminal lobe ovate to lanceolate or nearly linear; basal lobes narrower than the terminal; scapes as long as the leaves or commonly shorter; achenes obovate, 1 to 1½ lines long, winged all around, bearing a minute erect beak.—San Bernardino Mts.; n. through the Sierra Nevada to Lassen Co.; n. to B. C., e. to Nova Scotia.

3. **S. gréggii** J. G. Sm. Plants 2 to 4 ft. high; leaf-blades 8 to 16 in. long, on long petioles; basal lobes lanceolate, acuminate, widely divergent, longer than the lanceolate or ovate, acuminate terminal one; submersed leaves with an entire lanceolate blade 1½ or 2 in. long, or the blade wholly obsolete; whorls numerous; pedicels 4 to 12 lines long; petals orbicular with truncatish or broadly subcordate base, 7 to 10 lines broad, broader than long; stamens 22 to 30, the filaments about as long as the anthers, dilated at base; achenes with acute margins, the sides with an ear-shaped depression margined by a narrow wing and with one or two tube-like passages in the spongy pericarp near the ventral angle.—Lower San Joaquin River islands and shores.

4. **S. sanfòrdii** Greene. Leaves 2 to 3 ft. long; petioles obtusely triquetrous, ½ to 1½ in. thick at the base; blades linear- to oblong-lanceolate, 4 or 5 in. long, tapering into the spongy petiole, or almost obsolete in submersed plants; scapes stout, 1½ ft. high or more; whorls of flowers usually few; sepals ovate, 2 to 3 lines long; achenes 1 line long, winged on both the inner and outer margins, the sides reticulated; beak nearly erect, short, triangular.—Sloughs and pools, lower San Joaquin River.

5. **S. montevidénsis** C. & S. Stout; leaves sagittate, strongly many-ribbed; flowers 1 to 1¼ in. broad; petals white, with a brownish purple spot at base; fruiting heads of achenes very large, ¾ to 1¼ in. in diameter.—Introduced at Stockton and Penryn; native of Argentina.

HYDROCHARITÀCEAE. Frog's Bit Family

Aquatic herbs with dioecious or polygamous regular flowers from a spathe. Stamens 3 to 12. Ovary 1 to 3-celled, inferior; stigmas 3 or 6. Fruit maturing under water, many-seeded, indehiscent.

1. ELODÈA Michx.

Perennial herbs. Leaves opposite or whorled, crowded, sessile, pellucid. Flowers polygamo-dioecious, solitary and sessile, arising from a tubular 2-cleft axillary spathe. Staminate flowers minute, with 6-parted perianth (3 sepals, 3 petals), and 9 short stamens. Pistillate flowers with 3 calyx-lobes and 3 petals, its long calyx-tube at base coherent with the ovary; ovary 1-celled, with 3 parietal placentae; style capillary, coherent with calyx tube; stigmas 3; stamens 3 (sometimes rudimentary) or 6. (Greek elodes, marshy.)

1. **E. canadénsis** Michx. Water-weed. Stems slender, elongated, submerged, ¼ to 2 ft. long, varying according to depth of the water; leaves lanceolate to ovate or linear, 1 to 3 lines long; staminate flowers breaking off in anthesis, rising to the surface and shedding their pollen around the pistillate ones; pistillate flowers rising to and expanding on the surface by means of the elongated (2 to 10 in. long) calyx tube.—Rare in Cal.: Mendocino Co.; Truckee; Egg Lake, Modoc Co. Nearly throughout N. Am.

GRAMÍNEAE. Grass Family [1]

By A. S. Hitchcock, Systematic Agrostologist, U. S. Department of Agriculture; revised in 1921 by Agnes Chase, Assistant Agrostologist.

Herbs with usually hollow stems (culms) closed at the nodes, and 2-ranked parallel-veined leaves consisting of two parts, the sheath and the blade, the sheath enveloping the culm, the blade usually narrowly linear; at the junction of the sheath and blade on the inside, a membranaceous or hairy appendage, the ligule. Flowers minute, usually perfect, without a distinct perianth, arranged in spikelets consisting of a shortened axis (rachilla) and 2 to many 2-ranked bracts, the lowest pair (glumes) empty, each succeeding bract (lemma) including a single flower and, with its back to the rachilla, a 2-nerved bract (palea), the flower, lemma and palea together termed the floret. Spikelets arranged in panicles, racemes or spikes. Stamens usually 3, with delicate filaments and 2-celled anthers. Pistil 1, with a 1-celled 1-ovuled ovary, usually 2 styles and plumose stigmas. Fruit a caryopsis with starchy endosperm and a small embryo at the base, on the side opposite the hilum. Grain usually inclosed at maturity in the lemma and palea, free or adnate to the palea.

The stems are woody in bamboos (cultivated in California for ornament) and in a few other groups, and are solid in corn, sorghum and some other large grasses. The sheath is sometimes grown together at the margins, as in Melica and Glyceria. The plants may be monoecious as in the cultivated corn, or dioecious, as in Distichlis and Monanthochloë. One or both of the glumes may be wanting, as in Paspalum. The lemma may be sterile, that is, it may contain only stamens, or only the palea, or the latter may be suppressed, or the lemma itself may be variously modified as in the upper florets of Melica, or Bouteloua. The perianth is represented by 2 minute hyaline scales (lodicules) at the base of the flower, inside the palea. The stamens are rarely 1, 2, or 6, and the styles are rarely 1 or 3. The seed is free from the thin pericarp in Sporobolus, Eleusine and Crypsis.

Subfamily 1. Poàtae

Spikelets 1 to many-flowered, the reduced florets, if any, above the perfect florets (except in Phalarideae); articulation usually above the glumes; spikelets usually more or less laterally compressed.

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[1] Twenty-six of the drawings in illustration of this family are original; forty-six were generously loaned by the U. S. Department of Agriculture. The ranges for California were written by W. L. Jepson, chiefly on the basis of specimens determined by Dr. Hitchcock and Mrs. Chase.

Spikelets without sterile lemmas below the perfect floret (or these rarely present and like the fertile ones).
Spikelets not in deciduous groups of 3.
Spikelets pedicellate in open or contracted, sometimes spike-like panicles.
Spikelets 2 to many-flowered.
Glumes shorter than the first floret (except in Dissanthelium with long rachilla joints); lemmas awnless or awned from the tip or from a bifid apex.....Tribe 1. FESTUCEAE.
Glumes as long as the lowest floret, usually as long as the spikelet; lemmas awned from the back (spikelets awnless in Koeleria and Sphenopholis).....Tribe 3. AVENEAE.
Spikelets 1-flowered.....Tribe 4. AGROSTIDEAE.
Spikelets sessile on a usually continuous rachis (short-pedicellate in Leptochloa; the rachis disarticulating in Lepturus, Pholiurus, Hordeum, Sitanion, and a few species of allied genera).
Spikelets on opposite sides of the rachis; spike terminal, single.....Tribe 2. HORDEAE.
Spikelets on one side of the rachis; spikes usually more than 1, digitate or racemose.....Tribe 6. CHLORIDEAE.
Spikelets in groups of 3, 1 perfect, 1-flowered, 2 staminate, 2-flowered, sessile on the main axis, the groups falling entire.....Tribe 5. NAZIEAE.
Spikelets with 2 staminate, neuter, or rudimentary lemmas unlike and below the fertile lemma; no sterile or rudimentary florets above.....Tribe 7. PHALARIDEAE

SUBFAMILY 2. Panicàtae

Spikelets with one perfect terminal floret (disregarding those of the few monoecious genera and the staminate and neuter spikelets) and a sterile or staminate floret below, usually represented by a sterile lemma only, one glume sometimes (rarely both glumes) wanting; articulation below the spikelets, either in the pedicel, in the rachis, or at the base of a cluster of spikelets, the spikelets falling entire, singly, in groups, or together with joints of the rachis; spikelets, or at least the fruits, more or less dorsally compressed.

Spikelets all alike; glumes and sterile lemma membranaceous, fertile lemma and palea indurate.....Tribe 8. PANICEAE.
Spikelets in pairs, one sessile and perfect, the other pedicellate and staminate or neuter (the pedicellate one sometimes obsolete, rarely both pedicellate); glumes firm, lemmas hyaline.....Tribe 9. ANDROPOGONEAE.

TRIBE 1. Festùceae. FESCUE TRIBE

Spikelets 2 to several-flowered, in open or contracted panicles (racemose in nos. 4 and 19); lemmas awnless or awned from the tip or from just below it; rachilla disarticulating above the glumes, these remaining after the fall of the florets.

Lemmas divided at the summit into 5 to several awns or awn-like lobes; inflorescence a simple erect raceme.....19. ORCUTTIA.
Lemmas awnless, with a single awn, or, if 3, the lateral awns minute.
Tall stout reeds with large plume-like panicles; lemmas or rachilla with long silky hairs as long as lemmas.
Lemmas hairy; rachilla naked.....12. ARUNDO.
Lemmas naked; rachilla hairy.....13. PHRAGMITES.
Low or rather tall grasses, rarely over 1.5 m. tall.
Plants dioecious, perennial; lemmas glabrous; grasses of salt or alkaline soils.
Plants low and creeping; spikelets obscure, scarcely differentiated from the short crowded rigid leaves.....10. MONANTHOCHLOE.
Plants erect from creeping rhizomes; spikelets in a narrow simple exserted panicle.....11. DISTICHLIS.
Plants not dioecious (except in a few species of Poa with villous lemmas and in Eragrostis hypnoides).
Spikelets of two forms, sterile and fertile intermixed; panicle dense, somewhat one-sided.....15. LAMARCKIA.
Spikelets all alike in the same inflorescence.
Lemmas strongly 3-nerved.
Nerves of lemma conspicuously pilose below.....18. TRIODIA.
Nerves of lemma not pilose.
Glumes longer than the lemma; lateral nerves of lemma close to the margin, the internerves pubescent.....9. DISSANTHELIUM.
Glumes shorter than the lemmas; lateral nerves of lemma not close to the margin, the internerves glabrous.....8. ERAGROSTIS.
Lemmas 5 to many-nerved, the nerves sometimes obscure.
Glumes wanting, lemmas broad, flabellate; panicle dense, cylindric.....17. ANTHOCHLOA.
Glumes developed; lemmas not flabellate; panicle not cylindric.

Palea winged on the lower half of the keels; spikelets linear, in a loose raceme.....4. PLEUROPOGON.
Palea not winged on the lower half of the keels; inflorescence paniculate.
Lemmas as broad as long, the margins outspread; florets closely imbricate, horizontally spreading.....
7. BRIZA.
Lemmas longer than broad, the margins clasping the palea; florets not horizontally spreading.
Lemmas keeled on the back (somewhat rounded in Poa scabrella and its allies).
Spikelets strongly compressed, crowded in one-sided clusters at the ends of the stiff naked panicle branches.14. DACTYLIS.
Spikelets not strongly compressed, not crowded in one-sided clusters.
Lemmas awned from a minutely bifid apex (awnless or nearly so in Bromus unioloides and B. brizaeformis); spikelets large.....1. BROMUS.
Lemmas awnless; spikelets small..6. POA.
Lemmas rounded on the back (slightly keeled toward the summit in Festuca and Bromus).
Glumes papery; lemmas firm, strongly nerved, scarious-margined; upper florets sterile, often reduced to a club-shaped rudiment infolded by the broad upper lemmas; spikelets tawny or purplish, usually not green.....16. MELICA.
Glumes not papery; upper florets not unlike the others.
Nerves of the lemma parallel, not converging at the summit or but slightly so; lemmas awnless mostly obtuse.
Nerves prominent; plants usually rather tall, growing in woods or fresh-water marshes.....
3. GLYCERIA.
Nerves faint; plants low, growing in saline soil.5. PUCCINELLIA.
Nerves of the lemma converging at the summit; lemmas awned or pointed (upper florets only minutely awn-tipped in Bromus brizaeformis).
Lemmas entire, awned from the tip or pointed (minutely toothed in Festuca elmeri).2. FESTUCA.
Lemmas awned or awn-tipped from a minutely bifid apex.....
1. BROMUS.

TRIBE 2. Hórdeae. BARLEY TRIBE

Spikelets 1 to several-flowered, the rachilla usually disarticulating above the glumes and between the florets, sessile on opposite sides of a jointed or continuous axis, forming symmetrical (not one-sided) spikes. (Wheat, rye, and barley belong to this tribe.)

Spikelets solitary at each node of the rachis (rarely 2 in species of Agropyron, but never throughout).
Spikelets 1-flowered, sunken in hollows in the rachis; spikes slender, cylindric; low annuals.
Lemmas awned; florets lateral to the rachis.....21. SCRIBNERIA.
Lemmas awnless; florets dorsiventral to the rachis.
First glume wanting.....27. LEPTURUS.
First glume present, the pair standing in front of the spikelet.....
28. PHOLIURUS.
Spikelets 2 to several-flowered, not sunken in the rachis.
Spikelets placed edgewise to the rachis; first glume wanting except in the terminal spikelet.....26. LOLIUM.
Spikelets placed flatwise to the rachis.....20. AGROPYRON.
Spikelets more than 1 at each node of the rachis.
Spikelets 3 at each node of the rachis, 1-flowered, the lateral pair pediceled, usually reduced to awns.....25. HORDEUM.
Spikelets 2 at each node of the rachis, alike, 2 to 6-flowered.
Glumes wanting or reduced to 2 short bristles; spikelets horizontally spreading at maturity; spikes very loose.....24. HYSTRIX.
Glumes usually equaling the florets; spikelets appressed or ascending.
Rachis continuous; glumes broad or narrow, entire.....22. ELYMUS.
Rachis disarticulating at maturity; glumes subulate, extending into long awns, these and the awns of the lemmas making the spike very bristly.....23. SITANION.

Tribe 3. Avèneae. Oat Tribe

Spikelets 2 to several-flowered, in open or contracted panicles (rarely in racemes, solitary in Danthonia unispicata); rachilla usually disarticulating above the glumes and between the florets; glumes usually as long as or longer than the first lemma, commonly longer than all the florets; lemmas usually awned from the back or from between the teeth of a bifid apex, the awn bent, often twisted, the callus and rachilla joints usually villous.

Spikelets awnless or the upper lemma mucronate (minutely awned in Koeleria phleoides).
- Articulation below the glumes; glumes distinctly different in shape, the second widened above ..... 31. Sphenopholis.
- Articulation above the glumes; glumes similar in shape ..... 29. Koeleria.

Spikelets awned (commonly awnless in Trisetum wolfii).
- Florets 2, one perfect, the other staminate ..... 35. Notholcus.
- Florets 2 or more, all alike except the reduced upper ones.
  - Awn arising from between the teeth of a bifid apex, flattened, twisted; inflorescence a simple panicle or reduced to a raceme or even to a single spikelet ..... 36. Danthonia.
  - Awn dorsal, not flattened; lemma often bifid at apex.
    - Spikelets large, the glumes over 1 cm. long ..... 32. Avena.
    - Spikelets less than 1 cm. long.
      - Lemmas keeled, bidentate; awn arising from above the middle ..... 30. Trisetum.
      - Lemmas convex; awn from below the middle.
        - Rachilla prolonged behind the upper floret; lemmas truncate and erose-dentate at summit ..... 33. Aira.
        - Rachilla not prolonged; lemmas tapering into 2 slender teeth ..... 34. Aspris.

Tribe 4. Agrostídeae. Timothy Tribe

Spikelets 1-flowered, usually perfect, in open, contracted, or spike-like panicles.

Rachilla articulate below the glumes, the spikelets falling entire.
- Panicle open, drooping ..... 40. Cinna.
- Panicle contracted or spike-like.
  - Glumes awnless ..... 41. Alopecurus.
  - Glumes long-awned ..... 42. Polypogon.

Rachilla articulate above the glumes, these persistent after the fall of the florets.
- Fruit indurate, terete, awned, the nerves obscure; callus well-developed, bearded.
  - Awn trifid, the lateral divisions sometimes short, rarely obsolete (when obsolete no line of demarcation between awn and lemma as in the next) ..... 52. Aristida.
  - Awn simple, a line of demarcation between the awn and the lemma.
    - Awn persistent, twisted and bent, several to many times longer than the slender fruit; callus sharp-pointed ..... 51. Stipa.
    - Awn deciduous, not twisted, sometimes bent, rarely more than 3 or 4 times as long as the plump fruit; callus short, usually obtuse ..... 50. Oryzopsis.
- Fruit thin or firm, but scarcely indurate, if firm, the nerves prominent or evident; callus not well developed.
  - Glumes longer than the lemma (lemma equaling the glumes in Agrostis thurberiana).
    - Panicle feathery, capitate, nearly as broad as long; spikelets woolly ..... 45. Lagurus.
    - Panicle not feathery; spikelets not woolly.
      - Glumes compressed-carinate, abruptly mucronate, stiffly ciliate on the keels; panicle dense, cylindric or ellipsoid ..... 43. Phleum.
      - Glumes not compressed-carinate, not ciliate.
        - Glumes saccate at base; lemma long-awned; inflorescence contracted, shining ..... 44. Gastridium.
        - Glumes not saccate at base; lemma awned or awnless; panicles open or contracted.
          - Florets bearing a tuft of hairs at the base from the short callus, the hairs at least half as long as the lemma; palea present ..... 37. Calamagrostis.
          - Florets without hairs at base or with short hairs rarely as much as half the length of the lemma (A. hallii); palea usually small or wanting ..... 39. Agrostis.
  - Glumes not or scarcely longer than the lemma, usually shorter (the awn tips longer in Muhlenbergia racemosa).
    - Lemma awned from the tip or mucronate, 3 to 5-nerved (lateral nerves obsolete in M. repens) ..... 47. Muhlenbergia.
    - Lemma awnless or awned from the back.
      - Florets bearing a tuft of hairs at the base from the short callus; lemma and palea chartaceous, awnless ..... 38. Ammophila.
      - Florets without hairs at base.
        - Caryopsis at maturity falling from the lemma and palea; seed loose in the pericarp, this usually opening when ripe; lemma 1-nerved.
          - Inflorescence capitate in the axils of broad bracts ..... 49. Crypsis.

Inflorescence an open or contracted panicle. 48. SPOROBOLUS.
Caryopsis not falling from the lemma and palea, remaining permanently inclosed in them; seed adnate to the pericarp; panicle elongate. 46. EPICAMPES.

TRIBE 5. Nazïëae. CURLY-MESQUITE TRIBE

Spikelets sessile in groups of 3, the group falling entire from the continuous axis, the perfect spikelet 1-flowered, the staminate 2-flowered; glumes usually firmer than the lemma and palea, sometimes awned, the lemma awnless.

Only one genus in California. 53. HILARIA.

TRIBE 6. Chlorideae. GRAMA TRIBE

Spikelets 2 to several-flowered, sessile or short-pediceled, approximate or somewhat distant along one side of a slender rachis, the rachilla disarticulating above the glumes and between the florets; glumes unequal or nearly equal, awnless or mucronate, 1-nerved, usually shorter than the first lemma; lemmas obtuse or acute, sometimes 2-toothed and mucronate or short-awned from between the teeth, 3-nerved, the nerves sometimes pubescent.

Spikelets with few to several perfect florets. 54. LEPTOCHLOA.
Spikelets with 1 perfect floret, with or without additional imperfect florets above.
  Spikelets without additional modified florets, the rachilla sometimes prolonged.
    Spikes digitate, rachilla articulate above the glumes. 55. CYNODON.
    Spikes racemose, erect or nearly so; rachilla articulate below the glumes, the spikelets falling entire.
      Glumes equal, broad and boat shaped. 56. BECKMANNIA.
      Glumes unequal, narrow. 57. SPARTINA.
  Spikelets with 1 or more modified florets above the perfect one.
    Spikes digitate or nearly so. 58. CHLORIS.
    Spikes racemose along the main axis. 59. BOUTELOUA.

TRIBE 7. Phalarideae. CANARY GRASS TRIBE

Spikelets with one perfect terminal floret and, below this, a pair of staminate or neuter florets, the rachilla disarticulating above the glumes, the sterile florets falling attached to the fertile one.

Lateral florets staminate; spikelets brown and shining. 60. TORRESIA.
Lateral florets neuter; spikelets green or yellowish.
  Lateral florets consisting of awned hairy sterile lemmas exceeding the fertile floret; spikelet terete. 61. ANTHOXANTHUM.
  Lateral florets reduced to small awnless scale-like lemmas; spikelets much compressed laterally. 62. PHALARIS.

TRIBE 8. Paniceae. MILLET TRIBE

Spikelets with one perfect terminal floret and below this a sterile floret and two glumes; fertile lemma and palea indurate, or at least firmer than the glumes and sterile lemma; articulation below the spikelet.

Spikelet subtended or surrounded by 1 to many distinct or more or less connate bristles, forming an involucre.
  Bristles persistent, the spikelets deciduous. 68. CHAETOCHLOA.
  Bristles falling with the spikelets at maturity.
    Bristles not united except at base, slender, plumose. 69. PENNISETUM.
    Bristles united into a bur-like involucre, retrorsely barbed. 70. CENCHRUS.
Spikelets not subtended by bristles.
  Glumes or sterile lemma awned (awn reduced to a point in E. colonum). 67. ECHINOCHLOA.
  Glumes and sterile lemma awnless.
    Spikelets subsessile in slender racemes.
      Fruit cartilaginous-indurate, flexible, usually dark colored, the lemma with more or less prominent white hyaline margins, these not inrolled; racemes digitate. 63. SYNTHERISMA.
      Fruit chartaceous-indurate, the firm margins inrolled; racemes paired or racemose.
        First glume and the rachilla-joint forming a swollen ring-like callus at the base of the spikelet. 64. ERIOCHLOA.
        First glume wanting (developed in occasional spikelets); spikelets plano-convex. 65. PASPALUM.
    Spikelets pedicellate in open panicles. 66. PANICUM.

TRIBE 9. Andropogoneae. SORGHUM TRIBE

Spikelets in pairs along a rachis, the usual arrangement being one of the pair sessile and fertile, the other pedicellate and staminate or neuter, or rarely wanting, only the pedicel present; fertile spikelet consisting of one perfect terminal floret and, below this, a staminate or neuter floret, the lemmas thin or hyaline, and two awnless glumes, usually one or both firm or indurate.

Spikelets all perfect, surrounded by a copious tuft of soft hairs; racemes in a narrow spike-like panicle; spikelets awnless. 71. IMPERATA.

Spikelets unlike, the sessile perfect, the pedicellate sterile.
Racemes of several to many joints, solitary, digitate, or aggregate in a flabellate panicle....72. ANDROPOGON.
Racemes reduced to one or few joints, these mostly peduncled in a subsimple or compound panicle....73. HOLCUS.

TRIBE 1. Festùceae. FESCUE TRIBE

Spikelets 2 to several-flowered, in open or contracted panicles (racemose in 2 genera); lemmas awnless or awned from the tip or from just below it; rachilla disarticulating above the glumes, these remaining after the fall of the florets.

1. BRÒMUS L. BROME GRASS

Annuals or perennials, with closed sheaths, flat blades, and open or contracted panicles of large spikelets. Spikelets several to many-flowered. Glumes unequal, acute, the first 1 to 3-nerved, the second usually 3 to 5-nerved. Lemmas convex or keeled, 5 to 9-nerved, 2-toothed at the apex, awnless or usually awned from between the teeth. Palea usually shorter than the lemma. (Ancient Greek name for the oat.)

Plants annual; introduced weeds (except no. 1).
Lemmas narrow, gradually acuminate, the awn as long as the body of the lemma or longer.
Awn twisted, geniculate; apex of lemma produced into 2 aristate teeth....1. *B. trinii.*
Awn not twisted nor geniculate; apex of lemma not aristate.
Panicle drooping; pedicels capillary; second glume not over 10 mm. long..2. *B. tectorum.*
Panicle erect or nodding; pedicels stiff; second glume over 12 mm. long, or if only 10 mm. the panicle erect and compact; glumes narrow, acuminate, the first 1-nerved, the second 3-nerved.
Panicle erect, compact or dense.
Panicle compact; pedicels mostly less than 5 mm. long; culms pubescent at summit....3. *B. rubens.*
Panicle relatively loose, some of the pedicels at least 10 mm. long; culms glabrous....4. *B. madritensis.*
Panicle more or less nodding, loose and open.
Lemma and awn together 6 to 8 cm. long; first glume about 15 mm. long....5. *B. rigidus.*
Lemma and awn together not over 4 cm. long; first glume about 8 mm. long....6. *B. sterilis.*
Lemmas broad, abruptly narrowed above, the awn mostly shorter than the body.
Lemmas awnless, obtuse, inflated....7. *B. brizaeformis.*
Lemmas awned, not inflated.
Panicle contracted, usually dense, erect or nearly so.
Lemmas pubescent; sheaths velvety....8. *B. hordeaceus.*
Lemmas glabrous or scabrous.
Awn erect or nearly so, inserted just below the summit of lemma. 9. *B. racemosus.*
Awn divergent, inserted ¼ to ⅓ below the summit of lemma.... 10. *B. scoparius*
Panicle loose, nodding or drooping.
Sheaths and lemmas glabrous; margin of lemma inrolled toward the base at maturity, the rachilla partly visible..11. *B. secalinus.*
Sheaths pubescent; lemmas pubescent or glabrous, the margins not or rarely inrolled.
Panicles nodding, the branches and pedicels not elongate and flexuous; awns usually not over ⅔ as long as the broad glabrous or scaberulous lemma....12. *B. commutatus.*
Panicles drooping, the branches and pedicels flexuous; awns mostly as long as the body of the narrower lemma or longer.
Awns becoming divergent....13. *B. japonicus.*
Awns not becoming divergent....14. *B. arenarius.*
Plants perennial (no. 15 often flowering the first year), mostly natives.
Spikelets strongly flattened, the lemmas strongly keeled toward the summit.
Spikelets awnless or nearly so....15. *B. unioloides*
Spikelets awned.
Blades canescent and densely pilose, narrow or involute..16. *B. subvelutinus.*
Blades not canescent, glabrous or somewhat pilose, broader, flat.
Panicle narrow, the branches short and erect....18. *B. maritimus.*
Panicle open, the branches spreading or drooping.
Awn less than 7 mm. long; blades rather broad.17. *B. marginatus.*
Awn more than 7 mm. long; blades usually narrow.... 19. *B. carinatus.*
Spikelets not strongly flattened, the lemmas not keeled.
Panicle narrow.
Panicle stiff, the branches suberect....20. *B. suksdorfii.*
Panicle lax, the branches drooping....21. *B. porteri.*

Panicle open, the branches spreading.
Branches of panicle stiffly divaricate; blades short.....22. *B. orcuttianus.*
Branches drooping; blades elongate.
Lemmas pubescent throughout.....23. *B. grandis.*
Lemmas pubescent at margins or base only, or nearly glabrous.
Lemmas sparsely pubescent on back, ciliate on margins or nearly glabrous; first glume 1-nerved.....24. *B. vulgaris.*
Lemmas densely pubescent at base and margins; first glume 3-nerved.....25. *B. laevipes.*

1. **B. trínii** Desv. Culms erect, 3 to 6 dm. high; sheaths pilose or nearly smooth; blades usually pilose; panicle narrow, 10 to 20 cm. long, rather dense; spikelets 5 to 7-flowered, 1.5 to 2 cm. long; glumes acuminate, smooth, the first mostly 1-nerved, the second mostly 3-nerved; lemmas coarsely and sparsely pubescent, 5-nerved, 13 to 15 mm. long, the teeth 2 mm. long; awn 1.5 to 2 cm. long, twisted below, bent and strongly divaricate when old.—Dry plains and rocky or wooded slopes, Siskiyou Co. and southw., especially in desert regions; e. to Colo. and s. to Mex.; also Chile. Var. EXCÉLSUS Shear. Lemmas 7-nerved; awn scarcely twisted or bent.—Panamint Mts.

2. **B. tectòrum** L. DOWNY BROME. Culms tufted, 3 to 6.5 dm. high, the whole plant softly pubescent; panicle many-flowered, loose, drooping, commonly ⅓ the entire height of the plant; spikelets 1.5 to 2 cm. long, nodding; lemmas pubescent; awn 1.2 to 1.5 cm. long.—Waste places, throughout U. S.; nat. from Mediterranean region. Var. NÙDUS Klett & Richt. Spikelets glabrous; the common form in Cal.

3. **B. rùbens** L. RED BROME. Culms 1.5 to 3.8 dm. high, puberulent below the panicle; sheaths and blades pubescent; panicle erect, compact, ovoid, usually purplish, 4 to 8 cm. long; spikelets 7 to 11-flowered, about 2 cm. long; lemmas 5-nerved, pubescent or smooth, 1.2 to 1.5 cm. long, the apex deeply cleft into 2 long-acuminate hyaline teeth; awn about 2 cm. long.—Dry hills and in waste or cultivated ground; common especially in middle and S. Cal.; n. to Wash.; nat. from s. Eur.

4. **B. madritènsis** L. Culms tufted, 3 to 6 dm. high; sheaths smooth or the lower slightly pubescent; blades puberulent or nearly smooth; panicle erect, 4 to 8 cm. long, oblong-ovoid in outline, contracted, rather dense; lemmas 1.5 to 1.8 cm. long, usually glabrous or scabrous only, somewhat curved outward when old, distinctly 3 or faintly 5 to 7-nerved, with 2 acute hyaline teeth; awn rather stout, tapering, somewhat curved, 1.6 to 2.2 cm. long.—Open ground and waste places; nat. from Eur.

5. **B. rígidus** Roth. "RIPGUT" GRASS. Culms 4.5 to 7.5 dm. high; sheaths and blades pilose; panicle open, rather few-flowered, 6 to 10 cm. long; spikelets usually 5 to 7-flowered 3.5 to 5 cm. long; lemmas 5-nerved, scabrous or puberulent, 2-toothed; awn stout, 3.5 to 5 cm. long.—Weed in open ground and waste places, nat. from Mediterranean region. Var. GUSSÒNEI (Parl.) Coss. & Dur. (B. villòsus Forsk). Differs in having a more open panicle, and longer flexuous branches and pedicels, the lower branches as much as 10 to 12 cm. long.—More common than the species in mid. and n. Cal.; nat. from s. Eur. At maturity nos. 3 to 6 are injurious to grazing animals; the disjointed sharp-pointed florets with their long rough awns penetrate the eyes, nose and mouth parts, causing sores and blindness.

6. **B. stérilis** L. Similar to no. 5 but with smaller spikelets, the lemma including awn not over 4 cm. long; first glume about 8 mm. long.—Waste places; nat. from Mediterranean region.

7. **B. brizaefórmis** F. & M. Culms 3 to 6 dm. high; sheaths and blades pilose; panicle 5 to 15 cm. long, lax, nodding; spikelets oblong-ovate, laterally much compressed, 1.5 to 2.3 cm. long; glumes broad, obtuse, the first 3 to 5-nerved, about ½ the length of the broader 5 to 9-nerved second; lemma 1.1 cm. long, very broad, inflated, obtuse, smooth, with a broad scarious margin.—Sandy fields and waste ground, occasional; nat. from Eur.

8. **B. hordeàceus** L. SOFT CHEAT. Culms 2 to 7.5 dm. high; sheaths retrorsely softly pilose; blades usually pubescent; panicle contracted, erect, 5 to 10 cm. long, or in depauperate plants reduced to a few spikelets; glumes broad, obtuse, coarsely pilose or scabrous-pubescent, the first 3 to 5-nerved,

the second 5 to 7-nerved; lemmas obtuse, 7-nerved, coarsely pilose or scabrous-pubescent, rather deeply bidentate, 8 to 9 mm. long, the margin and apex hyaline; awn rather stout, 6 to 9 mm. long.—Weed in waste places and cultivated soil, abundant; nat. from Eur.

9. **B. racemòsus** L. Similar to no. 8, the panicle more open, the lemmas glabrous or scabrous.—Weed in waste places; nat. from Eur. (B. hordeaceus var. leptostachys Beck.)

10. **B. scopàrius** L. Culms 2 to 3 dm. high; sheaths and blades more or less pilose; panicle oblong or ovate, obtuse, 3 to 7 cm. long; spikelets short-pediceled, 5 to 11-flowered, 1 to 1.8 cm. long; glumes glabrous, the first 1 to 3-nerved, the second 3-nerved; lemmas 5-nerved, 7 to 8 mm. long; bidentate; awn somewhat divaricate, 7 to 8 mm. long.—Rare, Mariposa, Santa Barbara; nat. from Eur.

11. **B. secalìnus** L. CHEAT. CHESS. Culms erect, 3 to 6 dm. high; sheaths smooth; panicle pyramidal, drooping, 8 to 15 cm. long, open, the lower branches 3 to 5, unequal; spikelets ovoid-lanceolate, becoming somewhat turgid in fruit, 1.2 to 1.5 cm. long; glumes obtuse, the first 3 to 5-nerved, the second 7-nerved; lemmas 7-nerved, 6 to 8 mm. long, elliptic, obtuse, smooth or scabrous, the margin strongly involute in fruit, apex shortly bidentate, the undulate awn usually 3 to 6 mm. long. In fruit the turgid florets are somewhat distant so that, viewing the spikelet sidewise, the light passes through the small openings at the base of each floret.—Weed in grain fields and waste places; nat. from Eur.

12. **B. commutàtus** Schrad. Resembling no. 11; sheaths retrorsely pubescent; blades commonly pubescent; lemmas with an obtuse angle on the margin just above the middle, the margin not as strongly inrolled in fruit as in no. 11, the awn straight and rather longer than in no. 11.—Weed in fields and waste places; nat. from Eur.

13. **B. japónicus** Thunb. Culms erect or geniculate at base, 4.5 to 7.5 dm. high; sheaths and blades soft-pubescent; panicle 12 to 20 cm. long, broadly pyramidal, diffuse, the lower branches 3 to 5; glumes rather broad, the first narrower, acute, 3-nerved, the second obtuse, 5-nerved; lemmas broad, obtuse, smooth, 9-nerved, the marginal pair faint, 7 to 9 mm. long, the hyaline margin obtusely angled above the middle, the apex emarginate; awns about 1 cm. long, somewhat twisted and strongly divaricate at maturity, those of the lower florets shorter than the upper; palea conspicuously shorter than the lemma.—Weed in waste places; nat. from Eur. and the Orient.

14. **B. arenàrius** Labill. Culms 1.5 to 4.5 dm. high; sheaths and blades pilose; panicle pyramidal, open, the spreading branches and slender pedicels sinuously curved; spikelets 1.5 to 1.8 cm. long, densely pilose; glumes acute, scarious-margined, the first narrower, 3-nerved, the second 7-nerved; lemmas 7-nerved, 2-toothed; awn 1 to 1.5 cm. long.—Sandy roadsides, gravelly or sterile hills; cent. to S. Cal.; nat. from Australia.

15. **B. unioloìdes** (Willd.) H. B. K. RESCUE GRASS. Culms 6 to 9 dm. high; sheaths pilose; blades narrow, very scabrous; panicle open; spikelets 2 to 2.5 cm. long; glumes smooth, the first 5-nerved, 7 to 10 mm. long, the second 7-nerved, 10 to 12 mm. long; lemmas acute, subcoriaceous, glabrous or scabrous, 12 to 15 mm. long; awn not over 2 mm. long; palea ½ to ¾ as long as lemma.—Introd.; native country probably the Andes, now distributed from Chile to s. U. S. Cult. as meadow grass in Southern States.

16. **B. subvelùtinus** Shear. Culms 3 to 6 dm. high; sheaths canescent; blades narrow, rather rigid, becoming involute, canescent and also pilose; panicle 3 to 15 cm. long, narrow, stiff, the branches short, erect; spikelets about 25 cm. long; glumes puberulent, the first 3 to 5-nerved, the second 7-nerved; lemmas appressed-puberulent, 12 to 14 mm. long; awn 3 to 4 mm. long.—Dry wooded hills and meadows; n. to Ore., e. to Wyo.

17. **B. marginàtus** Nees. Short-lived perennial; culms rather stout, 6 to 12 dm. high; sheaths pilose; blades broad, flat, more or less pilose; panicle erect, rather narrow, 10 to 20 cm. long, the lower branches somewhat spread-

ing; spikelets 7 or 8-flowered, 2.5 to 3.5 cm. long; glumes broad, scabrous, or scabrous-pubescent, the first subacute, 3 to 5-nerved, the second obtuse, 5 to 7-nerved; lemmas subcoriaceous, coarsely pubescent, ovate-lanceolate, acute, 12 to 14 mm. long; awn 4 to 7 mm. long.—Open ground, open woods, roadsides and waste places; n. to B. C. and Alb., e. to Ariz. Var. SEMINÙDUS Shear. Sheaths glabrous; plant often tall and stout with large spreading panicle.—Woods or near streams, at higher altitudes; n. to B. C. and Assin., e. to Col.

18. **B. marítimus** (Piper) Hitchc. Differs from no. 17 in having smooth sheaths, scabrous but not pilose blades, and narrow strict panicle, the branches short and erect.—Near the coast from Sonoma Co. to Monterey Co.

19. **B. carinàtus** H. & A. CALIFORNIA BROME GRASS. Fig. 60. Culms 6 to 9 dm. high; sheaths pilose; blades narrow, flat, more or less pilose; panicle pyramidal, rather lax, the lower branches spreading or drooping; spikelets about 2.5 cm. long, 6 mm. wide, 5 to 9-flowered; glumes lanceolate, acute, glabrous or slightly scabrous-pubescent, the first 3-nerved, the second 5-nerved; lemmas lanceolate, puberulent or short-pubescent, 12 to 16 mm. long; awn 7 to 10 mm. long.—Open ground, open woods, roadsides and waste places, throughout the state; n. to Wash. Var. CALIFÓRNICUS Shear. Sheaths smooth; spikelets narrower than in the species.—Common in the Coast Ranges; infrequent in the Sierra Nevada and San Bernardino Mts. Var. HOOKERIÀNUS Shear. Sheaths smooth; spikelets as broad as in the species.—Range about as in the last, less common. Var. LINEÀRIS Shear. Sheaths pubescent; blades less than 2 mm. wide; panicle narrow, few-flowered. — Berkeley Hills; Mt. Lyell, above timber-line; known only from Cal.

60. Bromus carinatus H. & A.; *a*, habit x ¼; *b*, spikelet x 1½; *c*, floret (dorsal view) x 1½.

20. **B. suksdórfii** Vasey. Culms 6 to 9 dm. high; sheaths and blades smooth, scattered; panicle narrow, erect, rather dense, 8 to 13 cm. long, the branches erect or ascending; spikelets about 2.5 cm. long, the pedicels shorter; glumes glabrous, the first 1-nerved, the second 3-nerved; lemmas 1.2 to 1.4 cm. long, appressed-pubescent near margin and on the lower part of the midnerve.—Rocky woods and slopes, 6000 to 8500 ft., Sierra Nevada from Tulare Co. to Nevada Co.; n. to Wash.

21. **B. pòrteri** (Coult.) Nash. Culms 4.5 to 7.5 dm. high; sheaths more or less pubescent; blades 2 to 4 mm. wide; panicles rather few-flowered, the branches subcapillary; spikelets 2 to 2.5 cm. long, conspicuously pubescent throughout.—Dry woods, rare; e. to the Rocky Mts.

22. **B. orcuttiànus** Vasey. Culms erect, leafy below, nearly naked above, 7.5 to 10.5 dm. high; pubescent at and below the nodes; sheaths pilose or more or less velvety; blades glabrous, rather short and erect; panicle narrow-pyramidal, erect 10 to 15 cm. long, branches few, divaricate and rather rigid in fruit; spikelets 20 to 25 mm. long, subterete, on short stout pedicels; glumes narrow, smooth or scabrous, the first acute, 1-nerved, or sometimes with a faint lateral pair, the second broader, obtuse, 3-nerved; lemmas 10 to 12 mm. long, narrow, scabrous or scabrous-pubescent over the back, the awn 5 to 7 mm. long.—Open woods, mostly in the higher mountains; n. to Wash. Var. HÁLLII Hitchc. Blades soft-pubescent on both surfaces; glumes and lemmas pubescent.—Dry mostly wooded ridges and slopes, 5000 to 9000 ft., Sierra Nevada and mts. of S. Cal.

23. **B. grándis** (Shear) Hitchc. Culms 9 to 15 dm. high; sheaths pubescent; blades pubescent, elongated, spreading, rather lax; panicle broad, open, the branches slender, drooping, naked below, the lower usually in pairs, as much as 15 cm. long; first glume usually distinctly 3-nerved; lemmas densely

pubescent over the back; awns 5 to 8 mm. long.—Dry hillsides at moderate altitudes, S. Cal. and South Coast Ranges; n. to Wash. Resembles B. orcuttianus var. hallii, from which it differs in the open drooping panicle and the more distinctly 3-nerved first glume.

24. **B. vulgàris** (Hook.) Shear. Culms 9 to 12 dm. high; nodes pubescent; sheaths pilose; blades scattered, more or less pilose; panicle open, 10 to 18 cm. long, the branches slender, drooping; spikelets slender, about 2.5 cm. long; glumes narrow, sparsely pubescent, the first 1-nerved, acute, the second 3-nerved, broader and longer than the first, obtuse or acutish; lemmas 8 to 10 mm. long, sparsely pubescent over back, pubescent or ciliate near the margins or nearly glabrous; awn 6 to 8 mm. long.—Rocky woods and shady ravines, 100 to 7000 ft.; n. to B. C. and Mont. Var. EXÍMIUS Shear. Sheaths glabrous.—Moist mt. sides, n. Cal.; n. to B. C.

25. **B. laévipes** Shear. Culms 7½ to 9 dm. high, the base often decumbent and rooting; sheaths and blades glabrous; panicle broad, lax, drooping, 15 to 20 cm. long; spikelets 2.5 to 3 cm. long; glumes smooth, the first 3-nerved, the second 5-nerved; lemmas obtuse, 7-nerved, 12 to 14 mm. long, densely pubescent on the margin nearly to the apex and on the back at the base; awn 3 to 6 mm. long.—Moist woods and shady banks; n. to Wash.

2. FESTÙCA L. FESCUE

Annuals or perennials. Spikelets few to several-flowered. Glumes narrow, acute, unequal, the first sometimes very small. Lemmas rounded on the back, membranaceous or somewhat indurate, 5-nerved, the nerves often obscure, acute or rarely obtuse, awned from the tip or rarely from a minutely bifid apex. (Ancient name for some grass.)

Plants annual; florets narrowly lanceolate; stamens usually 1.—Subgenus VULPIA.
- Spikelets densely 5 to 13-flowered; lemmas without scarious margin...1. *F. octoflora.*
- Spikelets loosely 1 to 5-flowered; lemmas with narrow scarious margin; first glume 1-nerved, the second 3-nerved.
  - Branches of the short panicle normally divergent, a pulvillus at the base of at least 1 of them.
    - Florets mostly 3 to 5; only the principal panicle branches divergent.
      - Lemmas glabrous.
        - Glumes glabrous....2. *F. pacifica.*
        - Glumes hirsute....3. *F. confusa.*
      - Lemmas hirsute.
        - Glumes glabrous....4. *F. arida.*
        - Glumes hirsute....5. *F. grayi.*
    - Florets mostly 1 to 3; all the spikelets divergent.
      - Lemmas glabrous....6. *F. reflexa.*
      - Lemmas pubescent.
        - Glumes glabrous....7. *F. microstachys.*
        - Glumes pubescent....8. *F. eastwoodae.*
  - Branches of the narrow panicle erect or appressed.
    - Lower glume ⅔ to ¾ as long as the upper....11. *F. bromoides.*
    - Lower glume not more than ½ as long as upper.
      - Lemma ciliate....9. *F. megalura.*
      - Lemma not ciliate....10. *F. myuros.*

Plants perennial.
- Rhizomes developed; blades flat; lemma acuminate, unawned.—Subgenus HESPEROCHLOA....24. *F. confinis.*
- Rhizomes wanting (base of culm decumbent in F. rubra).—Subgenus EUFESTUCA.
  - Blades flat, rather soft and lax.
    - Lemmas awnless, indurated, not keeled....20. *F. elatior.*
    - Lemmas awned, membranaceous, more or less keeled.
      - Florets long-stipitate....21. *F. subuliflora.*
      - Florets sessile.
        - Awn terminal....23. *F. subulata.*
        - Awn from a cleft apex....22. *F. elmeri.*
  - Blades usually folded or involute, narrow or capillary.
    - Collar and auricles tomentose or bristly....19. *F. californica.*
    - Collar and auricles not conspicuously tomentose or bristly.
      - Lemmas acute, awnless or only awn-pointed....18. *F. viridula.*
      - Lemmas awned.
        - Tufts loose, the bases of the culms decumbent; blades usually smooth to the touch....12. *F. rubra.*
        - Tufts compact; culms erect.
          - Panicle open, the branches long and spreading; awn longer than body of lemma....14. *F. occidentalis.*

Panicle narrow, the branches ascending.
Blades scabrous, usually elongate.....15. *F. idahoensis.*
Blades smooth.
Plants about 12 dm. tall.....13. *F. howellii.*
Plants low, usually less than 1.5 dm. tall.
Blades hard, involute, shining, not angled.....
17. *F. supina.*
Blades soft, angled in drying, the tissue soft between the angles.....
16. *F. brachyphylla.*

1. **F. octoflòra** Walt. Culms slender, erect, usually 1.5 to 3 dm. high; blades narrow, involute; panicle narrow, the short branches mostly appressed; spikelets 6 to 8 mm. long; glumes subulate-lanceolate; lemmas firm, convex, glabrous or scabrous, 4 to 5 mm. long, attenuate into a scabrous awn 2 to 4 mm. long.—Open ground throughout the U. S. Var. HIRTÉLLA Piper. Lower, more densely tufted; foliage usually pubescent; lemmas hirtellous or pubescent.—Arid ground; more frequent than the species, cent. Cal. to Ariz. and Mex.

2. **F. pacífica** Piper. Culms slender, erect, 1.5 to 3 dm. high; blades soft, glabrous, loosely involute; panicle 2.5 to 6 cm. long, the lower branches solitary, divaricate; spikelets 3 to 6-flowered; glumes glabrous, the first subulate-lanceolate, the second lanceolate-acuminate; lemmas scabrous, except in the lowermost floret (this smooth), 6 to 7 mm. long, attenuate into a scabrous awn 10 to 15 mm. long.—Open ground, hill slopes and open woods in the mts. throughout the state; B. C. to Ariz. and L. Cal.

3. **F. confùsa** Piper. Differs from no. 2 in having hirsute glumes; plants small, slender; sheaths and blades pubescent; spikelets 2 to 3-flowered.—Dry hillsides; middle Cal.; n. to Wash.

4. **F. árida** Elmer. Culms 1 to 3.8 dm. high; sheaths glabrous or pubescent; blades soft, loosely involute, usually glabrous; panicle 2.5 to 7 cm. long, the solitary rays at length divaricate; glumes lanceolate, glabrous; lemmas densely villous, 6 to 7 mm. long, attenuate into a scabrous awn nearly as long.—Sandy ground, n. Cal.; Nev. (F. eriólepis of authors.)

5. **F. gràyi** (Abrams) Piper. Habit of no. 2, but somewhat stouter; sheaths and sometimes blades pubescent; glumes and lemmas hirsute throughout.—Open ground and rocky slopes; n. to Ore., e. to Ariz.

6. **F. refléxa** Buckl. Culms 2 to 4.5 dm. high; sheaths smooth or pubescent; blades narrowly linear, flat, or loosely involute; panicle 5 to 12 cm. long, the solitary rays and the spikelets all at length divaricate; spikelets 1 to 3-flowered, 5 to 7 mm. long; glumes glabrous; lemmas glabrous or somewhat scabrous, 5 to 6 mm. long, attenuate into a scabrous awn, usually 5 to 8 mm. long.—Mesas, rocky slopes and wooded hills; n. to Vancouver Isl., e. to Utah.

7. **F. micróstachys** Nutt. Habit of no. 6; differs in having pubescent lemmas.—Banks, hillsides and open ground; n. to Ore. Less frequent than no. 6.

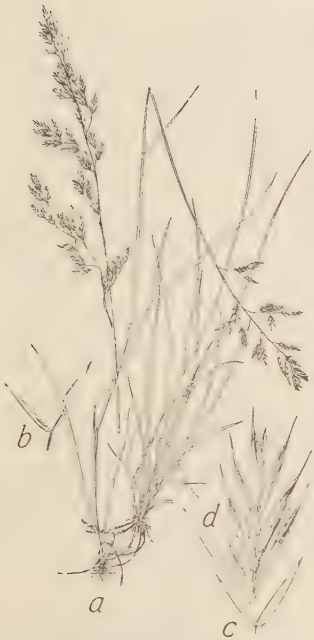
8. **F. èastwoodae** Piper. Differs from no. 6 in having pubescent glumes and lemmas.—Open pine forests; cent. Cal.

9. **F. megalùra** Nutt. Culms 2 to 6 dm. high; sheaths and blades smooth; panicle narrow, somewhat 1-sided, 8 to 20 cm. long; spikelets 4 or 5-flowered; glumes glabrous, the first about half the length of the second; lemmas scabrous above, attenuate into an awn about twice its length. The cilia on the lemmas, characteristic of this species, are sometimes hidden by the incurved edges of the lemma at maturity.—Cultivated or open ground, sandy soil, and waste places; n. to B. C. and Ida., s. to L. Cal.

10. **F. myùros** L. RAT'S-TAIL FESCUE. Similar to no. 9 but lemmas not ciliate.—Rare in waste grounds; nat. from Eur.

11. **F. bromoìdes** L. Similar to no. 9; culms 1 to 3 dm. high; panicle dense, 5 to 10 cm. long; lemma 7 to 8 mm. long, the awn 10 to 12 mm. long.—Dry hills and meadows; nat. from Eur.

12. **F. rùbra** L. RED FESCUE. Fig. 61. Culms erect from a decumbent base, smooth, 4.5 to 9 dm. high; sheaths smooth, the lowermost usually purple; blades smooth, soft, usually folded or involute; panicle 5 to 18 cm. long,



61. Festuca rubra L.; *a*, habit x ¼; *b*, *c*, glumes x 3; *d*, florets x 3.

usually contracted, the branches erect except at anthesis; spikelets 4 to 6-flowered, 7 to 10 mm. long, pale green or glaucous, often purple-tinged; lemmas 5 to 7 mm. long, smooth, or scabrous toward apex, the awn usually about ½ as long.—Meadows and hills in the mts. or near the coast; distributed throughout the cooler parts of the n. hemisphere.

13. **F. howéllii** Hack. Resembling no. 12 but stouter and 9 to 12 dm. high; culms numerous, erect at base, in a close tuft; blades 3 dm. or more long, folded, smooth; panicles smaller; spikelets 8 to 12 mm. long; lemmas about 7 mm. long, awned.—Rocky woods, Sonoma Co.; n. to Ore.

14. **F. occidentàlis** Hook. Culms densely tufted, slender, erect, 4.5 to 7.5 dm. high; leaves numerous, mostly basal; sheaths smooth; blades filiform-involute, bright green, soft, 5 to 20 cm. long; panicle loose, subsecund, 7 to 20 cm. long, nodding, the branches solitary or the lowest in pairs; spikelets loosely 3 to 5-flowered, 6 to 10 mm. long, mostly on slender pedicels, pale green; lemmas rather thin, 5 to 6 mm. long, scaberulous toward the apex, attenuate into a slender awn somewhat longer than the body.—Dry rocky wooded slopes and banks: Sequoia Park; San Mateo Co.; n. to B. C., e. to Wyo. and n. Mich.

15. **F. idahoénsis** Elmer. Blue Bunch Grass. Culms densely tufted, smooth or somewhat scabrous above, 3 to 9 dm. high; blades numerous, mostly basal, rather stiff and firm, more or less flexuous, scabrous, 1.5 to 3 dm. long, sometimes shorter; panicle narrow, 10 to 20 cm. long, the branches appressed or ascending, very scabrous; spikelets 8 to 10 mm. long; lemmas firm, the awn 2 to 4 mm. long.—Open woods and rocky slopes, 1000 to 2500 ft., cent. and n. Cal.; n. to B. C. and Alb., e. to Col.

16. **F. brachyphýlla** Schult. Culms erect, tufted, 1 to 1.5 dm. high; blades about ½ as long as the culms, filiform, soft, angled in drying, the tissue soft between the angles; panicle narrow, 2.5 to 5 cm. long, few-flowered; glumes and lemmas broad, rather soft; awn about 1 mm. long.—Mt. Dana; Blue Mts. of Ore. and Rocky Mts., n. to arctic Am.

17. **F. supìna** Schur. Culms erect, densely tufted, 0.8 to 1.5 dm. high; blades numerous, usually less than ½ the length of the culm, involute, smooth, firm and hard, scarcely angled in drying; inflorescence as in no. 16; lemmas firmer, narrower, involute, more scabrous, the florets looser, more numerous and the awn longer.—High montane, 9500 to 12,000 ft.: San Bernardino Mts.; Sierra Nevada from Tulare Co. to Mariposa Co.; White Mts.; n. to arctic Am.

18. **F. virídula** Vasey. Mountain Bunch Grass. Culms rather loosely tufted, erect, smooth, 6 to 9 dm. high; sheaths smooth; blades erect, 2 mm. wide or less, soft, scaberulous above, often more or less involute; panicle loose and open, 10 to 15 cm. long, the branches ascending; spikelets 3 to 6-flowered, 10 to 12 mm. long; glumes membranaceous, smooth; lemmas firm, membranaceous, keeled toward the apex, acute or somewhat mucronate, 6 to 7 mm. long.—Subalpine meadows in the Sierra Nevada from Eldorado Co. to Sierra Co.; Coast Ranges in Sonoma Co.; n. to Wash. and Ida.

19. **F. califórnica** Vasey. California Fescue. Culms tufted, stout, coarse, usually 9 to 15 dm. high, scabrous; sheaths somewhat scabrous, the collar and auricles pilose; blades flat or becoming involute, hard, firm, scabrous,

the lower elongate; panicle large, usually loose and open, the few long slender branches naked below, bearing a few spikelets toward the ends; spikelets compressed, about 5-flowered, 10 to 18 mm. long; glumes oblong-lanceolate, firm, smooth, except the scabrous keel; lemmas 8 to 10 mm. long, lanceolate, firm, scabrous, acuminate or short-awned.—Meadows, shady banks and wood borders; Coast Ranges from Monterey Co. to Siskiyou Co., n. to western Ore. Var. PARÍSHII (Piper) Hitchc. Plant more slender; culms about 4.5 to 6 dm. tall; sheaths puberulent; blades 1.5 to 2.5 dm. long, closely involute, smooth below or nearly so; panicle 10 to 12 cm. long; awn 3 to 4 mm. long.—San Bernardino Mts.

20. **F. elàtior** L. MEADOW FESCUE. Culms smooth, 2½ to 4 ft. high; sheaths smooth; blades flat, 4 to 8 mm. wide, scabrous above; panicle erect, or nodding at summit, 5 to 10 cm. long, contracted after flowering, the branches spikelet-bearing nearly to base; spikelets usually 6 to 8-flowered, 8 to 12 mm. long; glumes 3 to 4 mm. long, lanceolate; lemmas oblong-lanceolate, coriaceous, 5 to 7 mm. long, the scarious apex acutish.—Native of Eur., cult. in U. S. and escaped into fields and waste places.

21. **F. sùbuliflòra** Scribn. Culms rather slender, glabrous, 6 to 9 dm. high; sheaths sparsely hispidulous; blades flat, lax, hirsutulous above, 3 to 6 mm. wide; panicle loose, open, drooping, 10 to 20 cm. long, the branches slender, mostly solitary, naked below the middle; spikelets loosely 3 or 4-flowered; glumes subulate, glabrous, 1-nerved, 3 to 4 mm. long; lemmas lanceolate, scabrous toward the apex, 6 to 8 mm. long, tipped with a flexuous awn 10 to 15 mm. long, abruptly contracted at base into a hispidulous tubular structure including the rachilla, the latter apparently disarticulating half way between the florets.—Borders of moist woods, Humboldt and Del Norte Cos.; n. to Vancouver Isl.

22. **F. élmeri** Scribn. & Merr. Culms slender, 4.5 to 9 dm. high, glabrous; sheaths nearly smooth; blades flat, scabrous or pubescent above, 2 to 4 mm. wide; panicle 10 to 20 cm. long, loose, open, the branches mostly in pairs, naked below; spikelets 3 to 4-flowered, 7 to 10 mm. long; glumes lanceolate, glabrous; lemmas lanceolate, membranaceous, minutely hispidulous, 6 mm. long, the apex toothed, the scabrous awn 2 to 8 mm. long.—Wooded hillsides: Coast Ranges; Marysville Buttes; n. to Ore. Var. LUXÙRIANS Piper. Panicle rather close; spikelets 5 or 6-flowered.—Moist groves, San Francisco Bay region.

23. **F. subulâta** Bong. Culms scaberulous, 4.5 to 12 dm. high; sheaths nearly smooth; blades flat, thin, 3 to 10 mm. wide, auriculate at base, usually scabrous on both surfaces, lax, spreading; panicle very loose, drooping, 15 to 40 cm. long, the branches mostly in pairs, naked below; spikelets 3 to 5-flowered, 8 to 12 mm. long; glumes subulate; lemmas membranaceous, narrowly lanceolate, 3-nerved, somewhat keeled, attenuate into a scabrous awn 6 to 20 mm. long.—Moist rocky woods and shady banks: Sequoia Park; Warner Mts.; n. to Alas., e. to Wyo.

24. **F. confìnis** Vasey. Culms stout, erect, glabrous, 4.5 to 9 dm. high; sheaths smooth, striate; blades firm, flat or loosely involute, coarsely striate, 3 to 6 mm. wide; panicle narrow, erect, 8 to 20 cm. long, the branches short, appressed, floriferous nearly to base; glumes broadly lanceolate, subscarious, nearly smooth; lemmas ovate, acuminate, faintly nerved, scabrous all over the back, 5 to 8 mm. long.—Dry meadows, high montane: San Bernardino Mts.; cent. Sierra Nevada (Nevada Co.); n. to Ore.; e. to Mont. and Col.

3. GLYCÈRIA R. Br.

Tall aquatic or marsh perennials with flat blades, closed or partly closed sheaths, and open or contracted panicles. Spikelets few to many-flowered, subterete or slightly compressed. Glumes unequal, short, obtuse or acute, usually scarious, mostly 1-nerved. Lemmas broad, convex, firm, usually obtuse, awnless, scarious at the apex, 5 to 9-nerved, the nerves parallel, usually prominent. (Greek glukeros, sweet.) (Panicularia Heister.)

Spikelets linear, 1 to 1.5 cm. long; axis of panicles erect.
Lemmas smooth between the slightly scabrous nerves, thin.....2. *G. borealis*
Lemmas scabrous between the distinctly scabrous nerves, firm.
Lemmas 4 to 6 mm. long, subacute.....1. *G. fluitans.*
Lemmas about 3 mm. long, broadly obtuse.....3. *G. leptostachya.*
Spikelets ovate or oblong, not over 5 mm. long; panicles nodding.
Lemmas with 5 prominent nerves.
Panicle ovate or pyramidal, open.....4. *G. pauciflora.*
Panicle narrow, branches ascending.....5. *G. erecta.*
Lemmas with 7 prominent nerves.....6. *G. elata.*

1. **G. flùitans** R. Br. MANNA GRASS. Culms ascending from a decumbent rooting base, rather thick and succulent, 9 to 15 dm. high; blades 3 to 10 mm. wide, scabrous above; panicle long and narrow; glumes short, very unequal, obtuse; lemmas purple-tinged, broad, subacute, 4 to 6 mm. long, prominently 7-nerved, with an additional short pair near the margin, very scabrous on the nerves and somewhat so between them.—Shallow water, Mendocino Co.; n. to B. C.; n. N. Am. and Eurasia. (G. plicata Fries.)

62. Glyceria borealis Batchelder; *a*, habit x ⅓; *b*, spikelet x 2; *c*, florets x 3.

2. **G. boreàlis** (Nash) Batchelder. Fig. 62. Culms 6 to 9 dm. high, erect, from a more or less decumbent and rooting base; sheaths keeled; blades flat or usually folded, scabrous above, erect, 3 to 4 mm. wide; panicle long and narrow, the branches and slender pedicels appressed; spikelets nearly terete, pale, not purple-tinged; lemmas oblong, 4 mm. long, 7-nerved, smooth or indistinctly scabrous on the nerves. —Shallow water: Sierra Nevada, 4000 to 6000 ft.; North Coast Ranges; n. to Alas., e. to N. Eng.

3. **G. leptostàchya** Buckl. Culms about 12 dm. high; blades minutely scabrous above, about 4 mm. wide; panicle long and narrow; lemmas oblong, truncate, more or less purple-tinged, about 3 mm. long, prominently 7-nerved, distinctly scabrous. — In shallow water, Sonoma Co.; n. to Wash. (Panicularia davyi Merr.)

4. **G. pauciflòra** Presl. Culms 3 to 12 dm. high, from a decumbent rooting base with creeping rhizomes; blades scattered, 6 to 12 mm. wide, scabrous; panicle nodding, 10 to 20 cm. long, open, the branches spreading, naked below, rather densely flowered toward the ends; spikelets about 4 mm. long, about 5-flowered; glumes short, broad, obtuse; lemmas 2 mm. long, rounded and somewhat erose at summit, prominently 5-nerved, very scabrous on the nerves and somewhat so between.—Swamps, shallow water and wet meadows: Sierra Nevada; along the coast from San Francisco n. to Alas.; e. to Col.

5. **G. erécta** Hitchc. Differs from no. 4 in having shorter culms, the leaves somewhat crowded at base, and smaller less drooping panicles; intergrades with no. 4.—Springy places in mt. meadows, 4000 to 10,000 ft., Sierra Nevada; n. to Ore.

6. **G. elàta** (Nash) Hitchc. Culms erect, smooth, succulent, 9 to 18 dm. high; blades flat, usually 6 to 10 mm. or sometimes only 4 mm. wide, scabrous; panicle diffuse, becoming oblong, 15 to 30 cm. long, the branches naked below,

the lower usually reflexed at maturity; spikelets 3 to 5 mm. long, usually 6 to 8-flowered; glumes broad, obtuse, much shorter than the lower lemmas, nerveless; lemmas firm, obovoid, obtuse or acutish, prominently 7-nerved.—Wet meadows, springs, and shady moist soil of woods in the mts.; n. to B. C. and Ida.

4. **PLEUROPÒGON** R. Br.

Soft annuals or perennials, with flat blades and loose racemes of rather large many-flowered linear spikelets; glumes unequal, membranaceous or subhyaline, scarious at the somewhat lacerate tip, the first 1-nerved, the second obscurely 3-nerved; lemmas membranaceous, 7-nerved, with a round indurate callus at the base, the apex entire or 2-toothed, the midnerve extending into a short mucro or into an awn; keels of the palea winged on the lower half. (Greek pleura, side, and pogon, beard.)

Lemmas about 6 mm. long, scabrous and strongly nerved; spikelets not refracted; culm usually not over 6 dm. tall.....1. *P. californicus.*
Lemmas about 8 mm. long, smooth or slightly scabrous; spikelets often refracted; culms usually over 9 dm. tall.....2. *P. refractus.*

63. Pleuropogon californicus Benth.; *a*, habit x ¼; *b*, spikelet x 1; *c*, glumes x 1; *d*, palea x 1.

1. **P. califórnicus** (Nees) Benth. Fig. 63. Annual; culms 3 to 6 dm. high; blades short, abruptly narrowed at apex; racemes 15 to 20 cm. long; spikelets distant, about 2.5 cm. long, erect or somewhat spreading, short-pediceled; glumes obtuse; lemmas rather distant, 6 mm. long, scabrous, toothed and scarious at apex, the nerves prominent; awn variable, usually 6 to 12 mm. long, sometimes wanting; wings of palea prominent, toothed about the middle.—Wet meadows and marshy ground, San Mateo and Contra Costa Cos. to Mendocino Co.

2. **P. refráctus** (Gray) Benth. Perennial; culms 9 to 15 dm. high; spikelets often reflexed; lemmas 8 mm. long, only minutely scabrous, the nerves less prominent; awn variable, as much as 1 cm. long or nearly wanting; palea narrow, keeled to about the middle, scarcely toothed.—Bogs, wet meadows and mt. streams, Mendocino and Humboldt Cos.; n. to Wash.

5. **PUCCINÉLLIA** Parl.

Low pale smooth cespitose annuals or perennials with narrow or open panicles. Spikelets several-flowered, usually terete or only slightly flattened. Glumes unequal, shorter than the first lemma, obtuse or acute, rather firm, often scarious at the tip, the first 1-nerved or sometimes 3-nerved, the second 3-nerved. Lemmas usually firm, rounded on the back, obtuse or acute, rarely acuminate, usually scarious and often erose at the tip, glabrous or puberulent toward the base, 5-nerved, the nerves parallel, obscure or indistinct, rarely rather prominent. Palea about as long as the lemma or somewhat shorter. (Benedetto Puccinelli, an Italian botanist.)

Panicle open at maturity, the branches spreading or reflexed.
Leaves mostly in a short basal cluster; panicle usually less than 10 cm. long; lemmas smooth.....1. *P. lemmoni.*
Leaves scattered; panicle usually more than 10 cm. long; lemmas minutely pubescent toward base.....2. *P. nuttalliana*
Panicle narrow, the branches ascending or appressed.
Plant annual; panicles strict.....3. *P. simplex*
Plant perennial; panicles narrow but not strict.
Lemma entire at apex; plants mostly less than 3 dm. tall; panicles not much exceeding the leaves, the branches smooth or nearly so.4. *P. pauperc ula.*
Lemma ciliolate at apex; plants mostly more than 3 dm. tall; panicles large, exceeding the foliage, the lower branches as much as 7 cm. long, strongly scabrous.....5. *P. nutkaensis.*

1. **P. lémmoni** (Vasey) Scribn. Fig. 64. Plants perennial, slender, 1.5 to 3.8 dm. high; blades short, filiform, mostly basal, smooth, involute; panicle 5 to 10 cm. long, becoming open, the branches spreading; spikelets 5 to 6 mm.

long; glumes 1-nerved, 2 and 3 mm. long; lemmas 3 mm. long.—Alkaline soil, Sierra Nevada from Sierra Co. n.; Nev. to Ore.

2. **P. nuttalliàna** (Schult.) Hitchc. ALKALI MEADOW GRASS. Plants perennial, tufted, erect, 4.5 to 6 dm. high; sheaths and involute blades smooth; panicle open, 15 to 20 mm. long, the branches spreading, naked below; spikelets terete, about 6 mm. long, usually pale; glumes acutish, 1 and 2 mm. long; lemmas about 3 mm. long.—Alkaline soil throughout Cal.; e. to the Dakotas and Tex.

3. **P. símplex** Scribn. Culms 0.8 to 2 dm. high; blades narrow, soft, flat, scattered; panicle about ½ the entire length of the plant, the branches few, short, appressed; spikelets 6 to 8 mm. long, appressed; glumes strongly 3-nerved, 1 and 2 mm. long; lemmas 3.5 mm. long, tapering from below the middle to the acute apex, pubescent on lower half.—Alkaline soil, Great Valley and Mohave Desert.

4. **P. paupércula** (Holm) Fer. & Weath. var. **alaskàna** (Scribn. & Merr.) Fer. & Weath. Culms erect, tufted, about 3 dm. high; blades involute, erect, smooth; panicles narrow, 5 to 8 cm. long, the branches appressed; spikelets about 6 mm. long; glumes 3-nerved, 2 and 3 mm. long; lemmas 3 mm. long, sparingly pubescent at base, especially on the lower part of the rather prominent marginal nerves. — Saline soil, Mendocino Co.; n. to Alas.; on Atlantic Coast from Conn. northw. (P. angustata Nash.)

5. **P. nutkaénsis** (Presl) Fer. & Weath. Culms in small tufts, rather stout, 4.5 to 6 dm. high; leaves scattered, smooth, the blades loosely involute, more or less spreading; panicle 10 to 15 cm. long, the branches appressed; spikelets about 8 mm. long; glumes nearly equal, 3-nerved, narrow, about 3 mm. long; lemmas 4 mm. long, smooth.—Saline soil near the coast, San Mateo Co. to Marin Co.; n. to B. C. (P. festucaeformis of authors.)

64. Puccinellia lemmoni Scribn.; *a*, habit x ⅓; *b*, glumes x 3; *c*, florets x 3.

6. PÒA L. BLUE GRASS

Annuals or usually perennials with open or contracted panicles, and narrow blades with boat-shaped tips (except in no. 5). Spikelets 2 to several-flowered, the uppermost floret reduced or rudimentary. Glumes acute, keeled, somewhat unequal, the first 1-nerved, the second usually 3-nerved. Lemmas somewhat keeled, acute or acutish, awnless, membranaceous, often somewhat scarious at the tip, 5-nerved. (Greek poa, grass or fodder.)

Plants annual.
- Lemmas villous on the nerves below.
  - Panicle pyramidal, open; sheaths smooth ..... 1. *P. annua.*
  - Panicle narrow, contracted; sheaths scabrous ..... 2. *P. bigelovii.*
- Lemmas not villous on the keel and nerves.
  - Sheaths rough; lemmas pubescent on the back ..... 3. *P. howellii.*
  - Sheaths smooth; lemmas smooth ..... 4. *P. bolanderi.*

Plants perennial.
- Plants sod-forming, with creeping rhizomes.
  - Culms conspicuously flattened ..... 12. *P. compressa.*
  - Culms terete or slightly flattened.
    - Glumes about 8 mm. long; spikelet 1 to 1.5 cm. long ..... 5. *P. macrantha.*

Glumes and spikelets smaller.
Blades involute; plants of seacoast dunes.
Lemmas pilose on the keel; panicle a dense ovoid head; plants dioecious....6. *P. douglasii.*
Lemmas not pilose; panicle small but rather open...7. *P. confinis.*
Blades flat or folded; not seacoast plants.
Lemmas without cottony hairs at base.
Panicle almost spike-like; leaves mostly basal.....
8. *P. atropurpurea.*
Panicle open; culms leafy throughout.....9. *P. nervosa.*
Lemmas with a tuft of cottony hairs at base.
Lemmas not pilose on keel or nerves; leaves mostly basal....
10. *P. kelloggii.*
Lemmas pilose on keel and marginal nerves; culms leafy throughout.
Lemmas 3 mm. long; lower panicle branches in 5s.....
11. *P. pratensis.*
Lemmas 5 mm. long; lower panicle branches mostly in 2s.....13. *P. rhizomata.*
Plants in bunches, without creeping rhizomes.
Lemmas villous on the nerves or with a tuft of cottony hairs at base.
Lemmas with cottony hairs at base; blades flat.
Cottony hairs scant; plants less than 5 dm. tall; panicle few-flowered..
14. *P. leptocoma.*
Cottony hairs copious; plants commonly 6 to 13.5 dm. tall; panicle many-flowered.
Sheaths smooth; spikelets bronzed at tip.....15. *P. palustris.*
Sheaths retrorsely scaberulous.
Spikelets about 3 mm. long; panicle 0.8 to 1.6 dm. long, green.....16. *P. trivialis.*
Spikelets 5 to 7 mm. long; panicle 1.5 to 3 dm. long; pale..
17. *P. occidentalis.*
Lemmas without cottony hairs at base (see also no. 14, sometimes very obscurely cottony).
Blades soft, lax; alpine species.....18. *P. rupicola.*
Blades firm, stiff, folded or involute.
Ligule not over 1 mm. long.....19. *P. fendleriana.*
Ligule 5 to 7 mm. long.....20. *P. longiligula.*
Lemmas neither villous on the nerves nor with a cottony tuft at base, the internerves sometimes puberulent toward the base.
Lemmas minutely crisp-puberulent on the lower half or third.
Sheaths scaberulous; panicle usually narrow, somewhat elongate, the short branches mostly appressed.....21. *P. scabrella.*
Sheaths smooth.
Culms erect from a dense tuft of short leaves; panicle narrow....
22. *P. sandbergii.*
Culms decumbent and loose at base, the basal leaves relatively long; panicle open.....23. *P. gracillima.*
Lemmas glabrous or scabrous.
Panicle mostly over 1 dm. long, narrow, the branches appressed except in anthesis; plants rather robust, usually 6 dm. tall or more.
Sheaths scabrous; ligule 4 mm. long.....24. *P. nevadensis.*
Sheaths smooth; ligule not over 2 mm. long..25. *P. brachyglossa.*
Panicle less than 1 dm. long, compact or open.
Culm blades flat, the lower 2 to 3 mm. wide.....26. *P. epilis.*
Culm blades folded or involute, narrow or filiform.
Panicle compact, spike-like; plants of seacoast cliffs.....
27. *P. unilateralis.*
Panicle not spike-like, if narrow not compact.
Glumes 4 to 5 mm. long; panicle shining, usually pale..
28. *P. pringlei.*
Glumes 3 mm. long; panicle usually purple.....
29. *P. leibergii.*

1. **P. ánnua** L. In tufts or mats; culms flattened, 0.8 to 2 dm. long, decumbent at base, sometimes rooting at the lower nodes; blades soft, panicle 2.5 to 7 cm. long; spikelets crowded, 3 to 6-flowered, 3 to 4 mm. long; lemma not cottony at base, distinctly 5-nerved, the nerves pilose on lower half.—Open ground, along roadsides and in waste places, throughout the state, except in the deserts; extends from Alas. to Mex.; nat. from Eur.

2. **P. bigelòvii** Vasey & Scribn. Culms erect, 1.5 to 3.8 dm. high; panicle narrow, 7.5 to 15 cm. long, the branches short, appressed; spikelets ovate, about 6 mm. long; glumes acuminate; lemmas cottony at base, copiously pilose on the lower part of the lateral nerves and keel, villous on lower part of internerves.—Open ground, mostly in the deserts, Inyo Co. to San Diego Co.; e. to western Tex., s. to Mex.

3. **P. howéllii** Vasey & Scribn. Culms 3 to 9 dm. high; sheaths retrorsely scabrous; panicle ⅓ to ½ the entire height of the plant, open, the branches

in rather distant fascicles, spreading, naked below, some short branches intermixed; spikelets 3 to 4 mm. long, usually 3 or 4-flowered; glumes narrow, acuminate; lemmas cottony at base, 2 mm. long, ovate, pubescent over the lower ½ or ⅔, the nerves all rather distinct.—Rocky banks and shaded slopes at moderate altitudes, mostly in the Coast Ranges; s. to S. Cal., n. to Vancouver Isl.

4. **P. bolánderi** Vasey. Culms erect, 1.5 to 6 dm. high; sheaths smooth; panicle open, about ½ the entire plant, the branches few, distant, smooth, stiffly spreading or somewhat reflexed, naked below; spikelets, usually 2 or 3-flowered, about 5 mm. long; glumes broad; lemma sparsely cottony at base, smooth, scabrous on the keel, acute, the marginal nerves rather indistinct, the intermediate nerves obsolete.—Open ground or open woods, at high altitudes: San Jacinto Mts.; Sierra Nevada and n. to Siskiyou Co.; n. to Wash. and Alb., e. to Utah.

5. **P. macrántha** Vasey. Rhizomes extensively creeping; culms erect from a decumbent base, 1.5 to 4.5 dm. tall, the sterile shoots widely spreading; sheaths smooth, tawny, papery; blades smooth, involute, more or less curved or flexuous; panicle narrow, sometimes dense and spike-like, 5 to 13 cm. long, pale or tawny; spikelets about 5-flowered; glumes smooth, 3-nerved, or the second indistinctly 5-nerved; lemmas 8 mm. long, not webbed at base, short-pilose on the keel and marginal nerves below, slightly scabrous on the keel above and sparingly on the back near margins; palea ciliate on keels.—Sand dunes along the coast, Del Norte Co.; n. to Wash.

6. **P. douglásii** Nees. Fig. 65. Rhizomes extensively creeping; culms ascending from a decumbent base, usually less than 3 dm. high; sheaths smooth, tawny and papery; blades involute, some usually exceeding the culm; panicles ovoid or oblong, dense, spike-like, 2.5 to 5 cm. long, pale or tawny; spikelets 8 to 10 mm. long; glumes broad, 3-nerved, smooth, scabrous on upper part of keel, nearly equal; lemmas 6 mm. long, slightly cottony at base, villous on the lower part of keel and marginal nerves, scabrous on keel above, 1 to 3 pairs of indistinct intermediate nerves; palea ciliate on keels.—Sand dunes near the coast, Monterey Co. to Mendocino Co.

65. Poa douglasii Nees; *a*, staminate plant x ⅓; *b*, pistillate plant x ⅓; *c*, *d*, glumes and florets of pistillate spikelet x 4; *e*, *f*, glumes and florets of staminate spikelet x 2.

7. **P. confínis** Vasey. Culms low, often geniculate or ascending at base, usually less than 1.5 dm. high; sheaths and involute blades smooth; panicle narrow, contracted, 1.5 to 2.5 cm. long, tawny; spikelets about 4 mm. long; lemmas 3 mm. long, scaberulous, sparsely cottony at base, the nerves faint.—Sand dunes and sandy meadows near the coast, Mendocino Co.; n. to Alas.

8. **P. àtropurpùrea** Scribn. Culms 3 to 4.5 dm. high, slender; sheaths smooth; blades folded or involute, firm, smooth on under surface, the uppermost culm-leaf below the middle; panicle purple-tinged, 2.5 to 5 cm. long; spikelets 3 to 4 mm. long, turgid; glumes broad; lemmas 2 to 2.3 mm. long, broad, smooth, the

nerves faint.—Bear Valley, San Bernardino Mts., 6000 ft., not otherwise known.

9. **P. nervòsa** (Hook.) Vasey. Culms 3 to 7.5 dm. high; sheaths smooth or lower scaberulous, rarely retrorsely puberulent; ligule 1 to 2 mm. long; blades flat, lax, 3 to 4 mm. wide; panicle loose, the capillary branches spikelet-bearing at the ends; lemmas typically strongly nerved, scaberulous.—Moist rocks and banks, high montane; S. Cal. mts.; Sierra Nevada; n. to B. C. In the typical form the intermediate nerves of lemma are strong, but spikelets with faint intermediate nerves are found in same panicle with strong-nerved ones. P. olneyae Piper is a form with faint intermediate nerves and smooth lemmas.

10. **P. kellóggii** Vasey. Culms 3 to 6 dm. high; blades flat or folded, scabrous on upper surface; panicle pyramidal, open, 7.5 to 15 cm. long, the branches mostly in 1s or 2s, slender, spreading or reflexed, bearing a few spikelets toward the ends; spikelets rather loosely flowered, 4 to 6 mm. long; lemmas acute or almost cuspidate, 3 to 4 mm. long, smooth, rather obscurely nerved, conspicuously cottony at base.—Coast Ranges from Santa Cruz Co. to Humboldt Co.; n. to Ore.

11. **P. praténsis** L. KENTUCKY BLUE GRASS. Culms tufted, 3 to 9 dm. high; terete or slightly flattened; sheaths smooth, compressed; ligule about 2 mm. long; blades soft, flat or folded, the basal often elongate; panicle pyramidal, open, the slender branches in remote fascicles of 3 to 5, ascending or spreading, naked at base, some of them short; spikelets crowded, 3 to 5-flowered, 4 to 5 mm. long; lemmas 3 mm. long, copiously cottony at base, silky villous on keel and marginal nerves, the intermediate nerves prominent.—Open woods, banks, open ground; not in the deserts; extends throughout the northern part of N. Am. and Eurasia; extensively cult. as a pasture and lawn grass. Some forms are clearly native in the mts., while others, especially at low altitudes, are escaped from cult.

12. **P. compréssa** L. CANADA BLUE GRASS. Culms not tufted, geniculate-ascending, flattened, wiry, bluish green, 1.5 to 4.5 dm. high; panicle narrow, 2.5 to 10 cm. long, the usually short branches in pairs, spikelet-bearing to the base; spikelets crowded, subsessile, 3 to 6-flowered, 4 to 6 mm. long; lemmas firm, obscurely nerved, 2 to 2.5 mm. long, sparingly cottony at base, short-pubescent below on keel and marginal nerves.—Open ground, open woods, meadows and waste places throughout the U. S.; nat. from Eur.; often a troublesome weed. Distinguished from P. pratensis by the color and the flattened culms.

13. **P. rhizòmata** Hitchc. Culms erect, 3 to 6 dm. high; lower sheaths loose, papery; ligule 2 to 3 mm. long; blades flat or folded; panicle long-exserted, oblong, contracted, 2 to 5 cm. long, the branches short, mostly in 2s, ascending, few-flowered; spikelets about 6 mm. long, 3 to 5-flowered; glumes unequal, rather broad, acute, scabrous on the keels; lemmas 5 mm. long, acutish, copiously cottony at base, short-pilose on keel below, and sparingly so on lower part of marginal nerves, the intermediate nerves faint; palea ciliate on the keels.—Damp shady woods, Siskiyou and Modoc Cos.; n. to Ore. and Ida.

14. **P. leptócoma** Trin. Culms loosely tufted, erect from a slightly decumbent base, rather lax, 1.3 to 4.5 dm. high; blades lax, scaberulous; panicle loose, open, 5 to 10 cm. long, the slender spreading branches naked below, mostly in 2s; spikelets mostly 2 or 3-flowered, 5 to 7 mm. long; lemmas villous on the keel and less so on marginal nerves, intermediate nerves indistinct, the cottony tuft at base sometimes obscure.—Boggy or springy places at high altitudes, often in shade, Mt. Dana; Wash. to Alas.

15. **P. palústris** L. FOWL BLUE GRASS. Culms somewhat decumbent, flattened, and commonly purplish at base, 4.5 to 12 dm. high; ligule 3 to 5 mm. long; blades soft; panicle oblong-pyramidal, nodding, bronze or purplish, mostly more than 15 cm. long, the distant fascicled branches naked below; spikelets 2 to 4-flowered, about 4 mm. long; lemmas villous on keel and mar-

ginal nerves, intermediate nerves faint.—Meadows and moist open ground, Sierra Valley (rare in Cal.); throughout cold-temperate N. Am. and Eurasia.

16. **P. triviàlis** L. Rough Blue Grass. Culms erect from a decumbent base, often rather lax, scabrous below the panicle, 4.5 to 9 dm. high; ligule 4 to 6 mm. long; blades scabrous; panicle oblong, the lower branches mostly 5 in a whorl; spikelets usually 2 or 3-flowered; keel of lemma slightly pubescent, lateral nerves glabrous.—Moist places, Humboldt Co.; introd. from Eur.

17. **P. occidentàlis** Vasey. Culms rather robust, erect, scabrous, 9 to 13.5 dm. high; ligule 6 to 8 mm. long; blades scabrous, sometimes 7 mm. wide; panicle very loose, the slender distantly whorled spreading or reflexed branches spikelet-bearing toward the ends; spikelets 3 to 6-flowered; keel of lemma villous below, marginal nerves slightly villous.—Open woods, cent. Cal.; Alas. to Col. and N. Mex.

18. **P. rupícola** Nash. Culms erect, rather stiff, smooth, 1 to 2 dm. high; ligule about 1 mm. long; blades erect, 1 mm. wide or less, flat or loosely involute; panicle purplish, narrow, 2 to 4 cm. long; spikelets mostly 3-flowered, 5 mm. long; lemmas villous below on keel and marginal nerves; intermediate nerves faint.—Rocky slopes at high altitudes, Mono Pass in the Sierra Nevada; Ore., Rocky Mts.

19. **P. féndleriàna** (Steud.) Vasey. Mutton Grass. Densely tufted, pale; culms erect, smooth, scabrous below panicle, 3 to 4.5 dm. high; sheaths somewhat scabrous; ligule less than 1 mm. long; blades mostly basal, scabrous; panicle long-exserted, narrow, contracted, 2.5 to 8 cm. long; glumes broad; lemmas 4 mm. long, long-pilose on the lower portion of keel and marginal nerves, the intermediate nerves obscure.—Mesas and hills: San Bernardino Mts.; Panamint Mts.; Great Basin region from Wash. and Wyo. to N. Mex.

20. **P. longilígula** Scribn. & Wms. Similar to no. 19; culms smooth, 3 to 6 dm. high; sheaths and blades smooth; ligule 5 to 7 mm. long, or on the innovations somewhat shorter; panicle looser and often longer; spikelets as in no. 19.—Cañons and banks of streams, San Bernardino Mts.; Nev. to Mont. and N. Mex.

21. **P. scabrélla** (Thurb.) Benth. Malpais Blue Grass. Densely tufted; culms erect, 6 to 9 dm. high, usually scabrous, at least below panicle; sheaths scabrous; ligule 3 to 5 mm. long; blades mostly basal, flat, narrow, usually about 1 mm. wide, lax, more or less scabrous; panicle narrow, usually contracted, sometimes rather open at base, 5 to 12 cm. long; spikelets narrow, 6 to 10 mm. long; glumes scabrous; lemmas 4 mm. long, puberulent or scabrous on back, and more or less crisp-pubescent on lower half.—Meadows, woods, rocks and hills, common throughout the state and extending to Ore., Nev. and N. Mex. It is exceedingly variable and several forms have received specific names: P. orcuttiana Vasey and P. acutiglumis Scribn. represent a less scabrous form with relatively open panicle; P. nudata Scribn. is a form with subcapillary lax blades and small dense panicle; P. limòsa Scribn. & Wms. is a relatively robust, nearly smooth form with blades 3 to 4 mm. wide.

22. **P. sandbérgii** Vasey. Little Blue Grass. Similar to no. 21, differing in being smooth, averaging lower and more slender, the cushion of leafy shoots at base denser, the panicle smaller, the blades short and soft, often involute.—Plains and dry or rocky woods: cismontane S. Cal.; n. to B. C., e. to Wyo. Intergrades between this and no. 21 are not rare.

23. **P. gracíllima** Vasey. Densely tufted; culms 3 to 6 dm. high, erect from usually a decumbent base; ligule 3 mm. long; blades flat or folded, lax, smooth, mostly basal; panicle pyramidal, loose, 5 to 10 cm. long, the branches in whorls, the lower 2 to 6, 2.5 to 8 cm. long, slender, spreading, sometimes reflexed, naked below; spikelets 4 to 6 mm. long; lemmas about 4 mm. long, minutely scabrous, crisp-pubescent near base, especially on the nerves.—Rocks, woods, cliffs, higher Sierra Nevada; n. to Alas. Exceedingly variable. P. tenerrima Scribn. represents a form with filiform blades; P. alcea Piper is a form with leaves not aggregate at base, the sheaths slightly scaberulous.

24. **P. nevadénsis** Vasey. Nevada Blue Grass. Culms densely tufted, 4.5 to 9 dm. high, smooth; blades firm, involute, scabrous; panicle narrow, 10 to 15 cm. long; spikelets 6 to 8 mm. long, narrow; glumes narrow; lemmas smooth or scaberulous, 3 mm. long.—Plains and dry meadows, Mohave Desert and bordering mountain slopes, n. along the east side of the Sierra Nevada (or occasionally on its crests) to Siskiyou Co.; n. to Wash. and e. to Col. P. thurberiana Vasey is a rare form with spikelets having only 2 or 3 florets.

25. **P. brachyglóssa** Piper. Culms densely tufted, glabrous, 4.5 to 9 dm. high; blades stiff and firm, flat or involute; panicle narrow, 10 to 20 cm. long; spikelets 3 to 10 mm. long; glumes smooth; lemmas smooth or nearly so, 4.5 mm. long.—Dry slopes and cliffs, Sierra Nevada from Nevada Co. to Lassen Co. and n. to Siskiyou Co.; Nev. to Wash. and Ida.

26. **P. épilis** Scribn. Culms solitary or few in a tuft, 2 to 4 dm. high, with few to many basal shoots with smooth, usually folded blades longer than those of the culm; sheaths smooth; blades of culm leaves flat, 2.5 to 7 cm. long; ligule about 3 mm. long; panicle usually dense, purplish, 2.5 to 8 cm. long; spikelets 7 to 8 mm. long, the glumes 4 to 5 mm., the lemmas 5 to 6 mm. long.—Meadows, high Sierra Nevada; n. to B. C., e. to Col. (Cal. specimens were referred to P. cottoni Piper in Jepson Fl. Cal. 1:160.)

27. **P. ùnilateràlis** Scribn. Culms 1 to 3.8 dm. high; sheaths smooth, tawny and papery; panicle oblong, 2.5 to 8 cm. long; spikelets 6 to 8 mm. long; glumes broad, acute, smooth, indistinctly scabrous on keel near apex; lemmas 4 mm. long, scabrous on base of marginal nerves and apex of keel, the intermediate nerves faint; palea ciliate on keels.—Cliffs, bluffs and rocky meadows near the seashore, Humboldt Co. to Monterey Co.

28. **P. pringlei** Scribn. Culms 1 to 2½ dm. high, the base sometimes decumbent and rhizome-like; sheaths smooth, loose and papery; blades mostly basal, involute, usually not over 2.5 to 5 cm. long, smooth, the uppermost culm blade at or below the middle; panicle narrow, contracted, few-flowered; spikelets 6 to 8 mm. long, about 3-flowered; glumes equal, broad; lemmas 5 to 6 mm. long, smooth or scabrous.—Rocks and sand: high Sierra Nevada; Mt. Pinos; Siskiyou Co.; n. to Wash.

29. **P. leibérgii** Scribn. Culms 0.8 to 2 dm. high; sheaths smooth; ligule about 2 mm. long; blades mostly basal, firm, involute, smooth, short; panicle narrow, 2.5 to 5 cm. long, the branches short, appressed; spikelets 4 to 6 mm. long; lemmas 3 mm. long, smooth or scaberulous, the nerves obscure.—Alpine meadows and sterile gravelly alpine flats, 8500 to 12,000 ft., Sierra Nevada; n. to Ore. P. hauseni Scribn. is a form with finer softer blades and slightly smaller spikelets.

7. BRÌZA L. Quaking Grass

Ours low annuals with erect culms, flat blades, and open showy panicles, the pedicels capillary, the spikelets vibrating in the wind. Spikelets several-flowered, broad, often cordate, the florets crowded and spreading horizontally, the uppermost floret reduced. Glumes about equal, broad, papery-chartaceous, with scarious margins. Lemmas papery, broad, with scarious, spreading margins, cordate at base, several-nerved, the nerves often obscure, the apex in our species obtuse or acutish. Palea much shorter than the lemma. (Ancient Greek name for some grain, probably rye.)

66. Briza minor L.; *a*, glumes x 10; *b*, florets x 10.

Spikelets less than 5 mm. long.....1. *B. minor.*
Spikelets 10 to 15 mm. long, 10 mm. broad.....2. *B. maxima.*

1. **B. minor** L. Fig. 66. Culms erect, 1 to 3.8 dm. high; panicle erect, pyramidal, many-flowered, the main branches stiffly ascending, the capillary branchlets spreading; spikelets triangular-ovate, 3 mm. long.—Waste places; nat. from Eur.; rather common, cent. Cal., n. to B. C.

2. **B. máxima** L. Culms erect or decumbent at base, 3 to 6 dm. high; panicle nodding, few-flowered; spikelets ovate,

purplish or brownish, drooping, on capillary pedicels.—Native of Eur., sparingly escaped from gardens where cult. for ornament.

8. ERAGRÓSTIS Host

Annuals or perennials of various habit. Spikelets few to many-flowered, the florets usually closely imbricate, the lemmas often deciduous, the paleas persistent. Glumes somewhat unequal, shorter than the first lemma, acute or acuminate, 1-nerved, or the second rarely 3-nerved. Lemmas acute or acuminate, keeled or rounded on the back, 3-nerved, the nerves usually prominent. (Eros, love, agrostis, grass, from the common European name, "love-grass.")

Plants perennial; panicle narrow, compact, more or less interrupted....1. *E. secundiflora.*
Plants annual.
  Plants creeping, dioecious or polygamous.....2. *E. hypnoides.*
  Plants not creeping, culms sometimes decumbent at base; flowers perfect.
    Pedicels or keel of lemma (usually both) with minute saucer-shaped glands; naturalized weeds; spikelets about 3 mm. wide.....3. *E. cilianensis.*
    Pedicels and keel of lemma not glandular; natives.
      Pedicels appressed; panicles pilose in lower axils.....4. *E. caroliniana.*
      Pedicels ascending or spreading; panicle not pilose in axils.
        Pedicels nearly straight, ascending; tips of lemmas not appressed..... 5. *E. mexicana.*
        Pedicels flexuous, spreading; tips of lemmas appressed, the margin of spikelet almost entire.....6. *E. orcuttiana.*

1. **E. secúndiflòra** Presl. Culms erect or geniculate at base, stiff, 3 to 6 dm. high; sheaths pilose at the throat; panicles reddish or russet, the short mostly distant branches ascending, compactly flowered; spikelets many-flowered, about 4 mm. wide, the closely imbricate, sharp-pointed florets somewhat spreading; lemmas prominently nerved.—Open sandy soil, San Diego Co.; e. to Kan. and Fla., s. to Mex.

2. **E. hypnoìdes** (Lam.) B.S.P. Culms slender, extensively creeping, forming mats, with divaricate commonly fascicled branches; flowering culms erect, 0.5 to 1.3 dm. high; blades 1 to 3 cm. long; panicles pale, few-flowered, open, or the pistillate dense; spikelets about 2 mm. wide, many-flowered, sometimes 15 mm. or more long.—Sand bars and wet open ground; throughout the U. S., s. to S. Am.

3. **E. cílianénsis** (All.) Link. STINK GRASS. SNAKE GRASS. Fig. 67. Culms erect or ascending from a decumbent base, rather flaccid, freely branching, 2 to 6 dm. high; panicles greenish lead-color, 1.3 to 3.8 dm. long, rather densely flowered; spikelets 6 to 12 mm. long, 10 to 40-flowered, the florets closely imbricate; lemmas thin, the lateral nerves prominent.—Fields, roadsides and waste places: Tehama Co.; Butte Co.; Los Angeles; San Bernardino; West Riverside; Mecca; nat. from Eur. Strong-scented when fresh.

67. Eragrostis cilianensis Link; habit x ¼.

E. POAÈOÌDES Beauv., with narrower spikelets and gland-dotted leaf margins was found in Amador Co. (Clinton) in 1896; nat. of Eur.

4. **E. caroliniàna** (Spreng.) Scribn. Culms erect to prostrate-spreading, 1.5 to 4.5 dm. high, diffusely branched at base; sheaths sparingly pilose at summit; blades 2 to 3 mm. wide; panicle diffuse, 8 to 20 cm. long; spikelets 5 to 18-flowered, becoming linear, 4 to 8 mm. long; lemmas slightly scabrous on keel, the lateral nerves distinct but not prominent.—Fields, waste places and open ground, San Luis Obispo and Tulare Cos. to S. Cal., rare; e. to Me., s. to Mex. (E. pilosa of authors.)

5. **E. mexicàna** (Lag.) Link. Culms erect or spreading, 3 to 6 dm. high; sheaths hairy at the throat; blades often elongated; panicle diffuse, about half the entire height of the plant; spikelets 4 to 6 mm. long, 1.5 mm. wide, mostly 6 to 12-flowered, the slender pedicels mostly longer than the spikelet.—Weed in fields and waste places, S. Cal.; e. to N. Mex. and s. to Mex.

6. **E. orcuttiàna** Vasey. Resembles no. 5; differs in the more diffuse panicle with narrower, usually arcuate spikelets on shorter spreading pedicels.—Fields and waste places, S. Cal.

9. **DISSANTHÈLIUM** Trin.

Our species annual. Spikelets mostly 2-flowered. Glumes firm, nearly equal, acuminate, much longer than the lower floret, mostly exceeding all the florets, the first 1-nerved, the second 3-nerved. Lemmas strongly compressed, oval or elliptic, acute, awnless, 3-nerved, the lateral nerves near the margin; palea somewhat shorter than the lemma. (Greek dissos, double, and anthelios, floret.)

68. Dissanthelium californicum Benth.; *a*, glumes; *b*, florets. x 5.

1. **D. califórnicum** (Nutt.) Benth. Fig. 68. Culms 6 to 9 dm. high; ligule 2 to 6 mm. long; blades flat, lax; panicle narrow, loose, 15 to 20 cm. long, the lower fascicles of branches rather remote; lemmas about 3 mm. long, minutely villous, especially below.—San Clemente and Santa Catalina Isls.; rare.

10. **MONANTHÓCHLOE** Engelm.

A creeping wiry diœcious perennial with clustered short subulate leaves, the spikelets at the ends of the short branches, only a little exceeding the leaves. Spikelets 3 to 5-flowered, the uppermost florets rudimentary. Glumes wanting. Lemmas rounded on the back, convolute, narrowed above, several-nerved, those of the pistillate spikelets like the blades in texture. Palea narrow, in the pistillate spikelets convolute around the pistil, the rudimentary uppermost floret inclosed between the keels of the floret next below. (Greek mono, one, anthos, flower, and chloe, grass.)

1. **M. littoràlis** Engelm. Fig. 69. Plants forming extensive mats; flowering culms 0.8 to 2 dm. high; blades spreading-arcuate, rigid, 3 to 10 mm. long; inflorescence very inconspicuous.—Coastal salt marshes and mucky or gravelly tidal flats, Santa Barbara to San Diego and s. to tropical Am.; on the Atlantic Coast extending n. to Fla.

69. Monanthochloe littoralis Engelm.; *a*, habit x½; *b*, infl. x 4.

11. **DISTÍCHLIS** Raf.

Low diœcious perennial with extensively creeping rhizomes, erect, rigid, culms and short dense rather few-flowered panicles. Spikelets several to many-flowered. Glumes unequal, broad, acute, keeled, mostly 3-nerved, the lateral nerves sometimes faint or obscured by striations and intermediate nerves. Lemmas closely imbricate, firm, the pistillate coriaceous, the margins bowed out near the base, acute or acutish, 3-nerved, with several intermediate nerves or striations. Palea as long as the lemma or shorter, the pistillate coriaceous, inclosing the grain. (Greek distichos, 2-ranked.)

1. **D. spicàta** (L.) Greene. SALT GRASS. Fig. 70. Forming tough sod, glaucous; culms 1 to 6 dm. high; leaves numerous, blades stiff, often conspicuously distichous; panicle narrow, 2.5 to 8 cm. long; spikelets 8 to 15 mm. long.—Salt marshes and alkaline soil, low altitudes, common along

70. Distichlis spicata Greene; *a*, infl. of pistillate plant; *b*, infl. of staminate plant. x ⅓.

the coast, and in the interior valleys and deserts; extends from s. Brit. Am. to Mex.

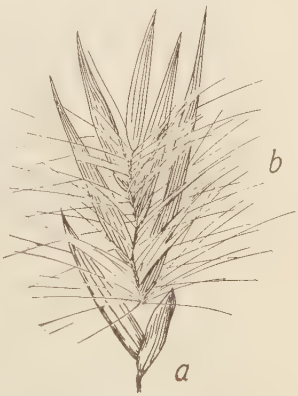
12. ARÚNDO L.

Tall perennial reeds with broad linear blades and large plume-like terminal panicles. Spikelets several-flowered, the florets successively smaller, the summits of all about equal, the rachilla glabrous. Glumes somewhat unequal, membranaceous, 3-nerved, narrow, tapering into a slender point, about as long as the spikelet. Lemmas thin, 3-nerved, densely long-pilose, gradually narrowed at the summit, the nerves ending in slender teeth, the middle one extending into a straight awn. (Ancient Latin name for reed.)

1. **A. dònax** L. Giant Reed. Culms stout, as much as 6 m. high and 2.5 cm. in diameter at base, from knotty branching rhizomes; blades numerous, broad, flat, 4 to 8 cm. wide on the main culm, smaller on the branches, the base cordate, more or less hairy-tufted; panicle 30 to 60 cm. long; spikelets about 12 mm. long.—Native of the Orient; escaped along irrigating ditches in cent. and S. Cal.

13. PHRAGMÌTES Adans. Reed

Perennial reeds with broad flat linear blades and large terminal panicles. Spikelets several-flowered, the rachilla clothed with long silky hairs, disarticulating at the base of each joint, the lowest floret staminate or neuter. Glumes 3-nerved, or the upper 5-nerved, lanceolate, acute, unequal, the first about half as long as the upper, the second shorter than the florets. Lemmas narrow, long-acuminate, glabrous, 3-nerved, the florets successively smaller. Palea much shorter than the lemma. (Greek phragmites, growing in hedges.)



71. Phragmites communis Trin.; *a*, glumes; *b*, florets. x 4.

1. **P. commùnis** Trin. Common Reed. Fig. 71. Culms robust, as much as 3.6 m. high, from stout creeping rhizomes, these sometimes on the surface, forming leafy stolons as much as 9 m. long; blades as much as 5 cm. wide, flat, the base somewhat narrowed, not hairy; panicle 15 to 40 cm. long; spikelets about 12 mm. long.—Freshwater swamps, marshes and around springs, Colorado and Mohave deserts and n. to Mendocino Co., not common; throughout temperate regions.

14. DÁCTYLIS L.

Perennials with flat blades and fascicled spikelets. Spikelets few-flowered, compressed, nearly sessile in dense one-sided fascicles, these borne at the ends of the few branches of a panicle. Glumes unequal, carinate, acute, hispid-ciliate on the keel. Lemmas compressed-keeled, mucronate, 5-nerved, ciliate on the keel. (Greek, daktulos, a finger.)

72. Dactylis glomerata L.; *a*, glumes; *b*, florets. x 5.

1. **D. glomeràta** L. Orchard Grass. Fig. 72. Culms in large tussocks, erect, 6 to 12 dm. high; blades broadly linear; panicle 8 to 20 cm. long, the few stiff branches naked below, contracted after flowering; spikelets 5 to 8 mm. long. —Cult. in U. S.; escaped along roadsides and in waste places; nat. of Eur.

Cynosùrus echinàtus L., a low weedy annual with bristly subglobose heads of two kinds of spikelets, perfect and sterile intermixed, has been found in Marin Co.

15. LAMÁRCKIA Moench

A low erect annual with flat blades and oblong one-sided compact panicles, the crowded fascicles drooping, falling entire, the fertile spikelets hidden, except the awns, by the sterile ones. Spikelets of two kinds, in fascicles, the terminal one of each fascicle fertile, the others sterile. Fertile spikelet with 1 perfect floret, the rachilla produced beyond the floret, bearing a small awned empty lemma or reduced to an awn; glumes narrow, acuminate or short-awned, 1-nerved; lemma broader, raised on a slender stipe, scarcely nerved, bearing just below the apex a delicate straight awn. Sterile spikelets linear, 1 to 3 in each fascicle, consisting of 2 glumes similar to those of the fertile spikelet, and numerous distichously imbricate obtuse awnless empty lemmas. (Jean Baptiste Antoine Pierre Monnet, Chevalier de La Marck, eminent French naturalist.)

73. Lamarckia aurea Moench; fascicle of spikelets x 5.

1. **L. aúrea** Moench. GOLDEN-TOP. Fig. 73. Culms 1 to 3.8 dm. high; leaves smooth; ligule prominent, decurrent as a broad scarious margin; panicle 2.5 to 10 cm. long, 1.5 to 2.5 cm. wide, shining, golden-yellow or purplish; fertile spikelet about 2 mm. long, the sterile 4 to 8 mm. long.—Cult. and waste ground, common in S. Cal., rarer northw.; nat. from Mediterranean region.

16. MÉLICA L.

Rather tall perennials, the base of the culm often swollen into a corm, with closed sheaths, usually flat blades, narrow or sometimes open, usually simple panicles of relatively large spikelets. Spikelets 2 to several-flowered, the rachilla prolonged beyond the perfect florets and bearing at the apex two or three gradually smaller empty lemmas, convolute together or the upper inclosed in the lower. Glumes somewhat unequal, thin, often papery, scarious margined, obtuse or acute, sometimes nearly as long as the lower floret, 3 to 5-nerved, the nerves usually prominent. Lemmas convex, several-nerved, membranaceous or rather firm, scarious-margined, sometimes conspicuously so, awnless or sometimes awned from between the teeth of the bifid apex. (Old Italian name for sorghum, from mel, honey.)

Spikelets narrow; glumes usually narrow, scarious-margined; sterile lemmas similar to the fertile, the latter acute or awned.—(Sect. BROMELICA.)
- Lemmas long-awned from a bifid apex ..... 1. *M. aristata.*
- Lemmas awnless or nearly so.
  - Culms not bulbous at base; lemmas mucronate ..... 2. *M. harfordii.*
  - Culms bulbous at base; lemmas acute or acuminate, awnless.
    - Lemmas acuminate; panicle narrow, the branches short .... 3. *M. subulata.*
    - Lemmas subacute to obtuse; panicle broad, the branches long and spreading. 4. *M. geyeri.*

Spikelets broad; glumes broad and papery; lemmas awnless; sterile lemmas small, convolute, more or less hidden in the upper fertile lemmas.—(Sect. EUMELICA.)
- Culms bulbous at base.
  - Pedicels capillary, flexuous or recurved ..... 5. *M. spectabilis.*
  - Pedicels stouter, appressed.
    - Panicle narrow; branches short, erect ..... 6. *M. bella.*
    - Panicle open; branches spreading.
      - First glume about 3 mm. long ..... 7. *M. fugax.*
      - First glume about 8 mm. long ..... 8. *M. inflata.*
- Culms not distinctly bulbous at base (somewhat bulbous in no. 11).
  - Spikelets reflexed, large ..... 9. *M. stricta.*
  - Spikelets not reflexed, smaller.
    - Fertile florets 3 or 4 in each spikelet; spikelets 10 to 12 mm. long.
      - Spikelets silvery white; glumes about as long as spikelet; plant tall, somewhat woody ..... 10. *M. frutescens.*
      - Spikelets tawny or purplish; glumes shorter than spikelet; plant lower, herbaceous ..... 11. *M. bulbosa.*
    - Fertile florets 1 or 2 in each spikelet; spikelets 4 to 6 mm. long.
      - Fertile lemmas pubescent ..... 12. *M. torreyana.*
      - Fertile lemmas glabrous ..... 13. *M. imperfecta.*

1. **M. aristàta** Thurb. Culms erect or decumbent below, not bulbous at base, smooth, 6 to 9 dm. high; sheaths scabrous or pubescent; blades flat,

more or less pubescent; panicle narrow, the branches short, appressed; glumes 5-nerved, 10 to 12 mm. long; lemmas 5-nerved, scabrous, the awn 6 to 10 mm. long.—Dry woods, slopes and meadows, 4000 to 6500 ft., Sierra Nevada from Fresno Co. to Nevada Co. and n. to Siskiyou Co.; far n. to Wash.

2. **M. harfórdii** Boland. Culms 6 to 12 dm. high, decumbent below, smooth, not bulbous at base; sheaths smooth; blades scabrous, firm; panicle narrow, the branches appressed; glumes about 6 mm. long, obtuse; lemmas 7-nerved, pilose on lower part of margin, the apex emarginate, mucronate or with an awn less than 2 mm. long.—Open dry woods and slopes, Monterey Co. to Shasta Co.; n. to B. C.

3. **M. subulàta** (Griseb.) Scribn. Culms 6 to 12 dm. high, bulbous at base; spikelets 2 to 2.5 cm. long, loosely several-flowered; glumes obscurely nerved; lemmas prominently 7-nerved, gradually acuminate, the keel and marginal nerves pilose-ciliate.—Meadows, banks and shady slopes, Coast Ranges from Marin Co. to Siskiyou Co., thence southeasterly in the Sierra Nevada to Placer Co.; n. to Alas., e. to Wyo.

4. **M. géyeri** Munro. Culms 9 to 15 dm. high, bulbous at base; sheaths glabrous or sometimes pubescent; blades scabrous, flat; panicle open, the lower branches slender, spreading, bearing a few spikelets above the middle; spikelets 1.2 to 2 cm. long; glumes broad, smooth, papery; lemmas scaberulous.—Wooded ravines and along streams, Coast Ranges from Santa Clara Co. northw., and Sierra Nevada from Nevada Co. northw.; n. to Ore.

5. **M. spectábilis** Scribn. Showy Onion Grass. Culms 3 to 9 dm. high; panicle narrow, the branches appressed; spikelets broad, purple-tinged, 10 to 15 mm. long, 4 or 5-flowered, nodding; glumes shorter than the lower lemma; lemmas strongly 7-nerved, obtuse.—Rocky or open woods and thickets, North Coast Ranges; n. to Wash., e. to Col.

6. **M. bélla** Piper. Onion Grass. Culms 3 to 6 dm. high; sheaths and blades glabrous or scabrous; spikelets 10 to 15 mm. long, narrower than in no. 5, papery with age; lemmas obscurely nerved, obtuse or slightly emarginate.—Rocky woods and hills: Sierra Nevada, 4000 to 7000 ft.; Coast Ranges from Santa Clara Co. to Mendocino Co.; n. to Wash., e. to Col. Var. intónsa Piper. Leaves softly pubescent.—Coast Ranges; n. to Wash.; Nev.

7. **M. fùgax** Boland. Culms 3 to 6 dm. high; sheaths and blades smooth; panicle narrow but open, the few lower branches 2.5 to 5 cm. long, stiffly spreading, few-flowered; spikelets 6 to 7 mm. long, 2 or 3-flowered, usually purple-tinged; second glume nearly as long as spikelet; lemmas obscurely nerved, obtuse or emarginate.—Dry hills, Siskiyou Co.; n. to Wash., e. to Nev.

8. **M. inflàta** (Boland.) Vasey. Culms 6 to 9 dm. high; panicle more or less open, the few branches long, spreading at least in anthesis; spikelets several-flowered, 1.5 cm. long, broad, pale green; glumes shorter than the lemmas, scabrous on the strong nerves; lemmas scabrous, strongly nerved.—Wet meadows, Mt. Shasta and Yosemite Park.

9. **M. stricta** Boland. Culms 1.5 to 4.5 dm. high, the base somewhat thickened but not bulbous; panicle narrow, few-flowered, nearly simple, usually 1 or 2 branches below; spikelets large, about 1.5 cm. long, reflexed on rather delicate pedicels; glumes longer than the lower lemma; lemmas scabrous, obtuse.—Rocky slopes and banks: San Bernardino Mts.; Mt. Pinos; Coso Mts.; Sierra Nevada; n. to Ore., e. to Utah.

10. **M. frutéscens** Scribn. Culms 6 to 18 dm. high, rather woody below; blades short, especially on the branches and innovations; panicle silvery shining, narrow, the branches short, appressed; spikelets about 1.5 cm. long; glumes prominently 5-nerved; lemmas acute, entire, 7-nerved.—Hills and cañons, Panamint Mts., s. through S. Cal. to L. Cal.

11. **M. bulbòsa** Geyer. Fig. 74. Culms 6 to 12 dm. high, the base usually decumbent and often more or less bulbous or corm-like; lower sheaths on the older culms persistent, brown and split into numerous fibers; panicle narrow,

74. Melica bulbosa Geyer; base of plant and part of panicle x 1.

rather densely flowered, tawny or purplish, not silvery shining; spikelets 10 to 12 mm. long, papery, 3 or 4-flowered; second glume about 7 mm. long; lemmas rather prominently 7-nerved. —Mt. meadows and rocky woods, Ventura Co., n. through the Coast Ranges and Sierra Nevada to Ore. and Nev.

12. **M. torreyàna** Scribn. Culms from a loose and decumbent base, 3 to 6 dm. high; blades flat, lax; panicle narrow, rather loose, the branches more or less fascicled, appressed or ascending, the lower fascicles distant; glumes strongly nerved, nearly as long as spikelet; rudiment long-pediceled, obovoid-truncate, divergent.—Thickets and banks at low altitudes: Coast Ranges from Santa Cruz Co. to Mendocino Co.; Sierra Nevada from Mariposa Co. to Butte Co.

13. **M. imperfécta** Trin. Culms erect, 3 to 9 dm. high; blades narrow, usually not over 2 mm. wide; panicle narrow, 1 to 3 dm. long, the unequal branches more or less fascicled; glumes indistinctly nerved; lemma a little longer than the glumes, smooth, indistinctly nerved, obtuse; rudiment oblong, appressed to the palea.—Dry open woods and rocky hillsides, lower altitudes, frequent in cismontane Cal.: Coast Ranges from Sonoma Co. to San Luis Obispo Co.; Sierra Nevada from Mariposa Co. to Kern Co.; s. to L. Cal. Forms intermediate between the species and the following varieties are not infrequent. Var. FLEXUÒSA Boland. Lower panicle branches spreading or reflexed.—Wooded hillsides and rocky banks, S. Cal., n. in the Sierra Nevada to Mariposa Co. and n. in the Coast Ranges to Santa Cruz Co. Var. MÌNOR Scribn. Culms less than 3 dm. high; blades sub-filiform; scarcely a distinct variety.—Dry hillsides and crevices of rocks, South Coast Ranges from Santa Cruz Co. s. to S. Cal. and L. Cal.; s. Sierra Nevada in Tulare Co. Var. REFRÁCTA Thurb. Differs in having pubescent blades and spreading or reflexed lower branches of the panicle.—Gravelly brushy slopes, Tehachapi Range and Mt. Pinos, s. to L. Cal.

17. ANTHÓCHLOA Nees

Our species a low annual with cylindrical spike-like panicle. Spikelets few-flowered, subsessile, on a simple axis and imbricate, the rachilla disarticulating between the florets. Glumes (in our species) wanting. Lemmas thin-membranaceous, flabelliform, whitish, petal-like, many-nerved. Palea narrower than the lemma, hyaline. (Greek anthos, flower, and chloa, grass.)

1. **A. colusàna** (Davy) Scribn. Fig. 75. Culms ascending from a decumbent base, 0.8 to 3 dm. high; leaves overlapping, scarious between the nerves, loosely folded around the culm, not differentiated into sheath and blade, 1 to 1.2 cm. wide at the middle, tapering to each end, minutely ciliate with raised glands on the margins and nerves; panicles pale green, partially included, 4 to 8 cm. long, 8 to 10 mm. wide, the summit of the axis bearing, instead of spikelets, lanceolate-linear empty bracts; spikelets subsessile, usually 5-flowered, 6 to 7 mm. long, erect; lemmas ciliolate-fringed. — Bordering rain-pools on the hard uncultivated alkali "goose-lands" near Princeton, Colusa Co., on the road to Norman, the station now cult. as a rice field; Waterford, Stanislaus Co.

75. Anthochloa colusana Scribn.; *a*, habit x ¼; *b*, spikelet displayed x 2; *c*, spikelet (natural) x 2; *d*, floret x 2; *e*, lemma x 2; *f*, palea x 2; *g*, pistil x 4.

18. TRIÒDIA R. Br.

Erect tufted rarely stoloniferous perennials with usually flat blades and open or

contracted panicles. Spikelets several-flowered. Glumes membranaceous, often thin, nearly equal, the first sometimes narrower, 1-nerved or the second rarely 3 to 5-nerved, acute or acuminate. Lemmas broad, rounded on the back, the apex from minutely emarginate or toothed to deeply and obtusely lobed, 3-nerved, the lateral nerves near the margins, the midnerve excurrent between the lobes as a minute point or as a short awn, the lateral nerves often excurrent as minute points, all the nerves pubescent below, the lateral ones sometimes conspicuously so throughout. Palea broad, the two nerves near the margin, sometimes villous. (Greek tri, three, odous, tooth.) (Tridens R. & S.)

Panicle narrow, exserted.....1. *T. mutica.*
Panicle capitate, overtopped by the leaves.....2. *T. pulchella.*

1. **T. mùtica** (Torr.) Scribn. Culms erect, 3 to 6 dm. high; blades involute, scabrous; panicle narrow, 7.5 to 15 cm. long, the branches short, appressed; spikelets terete, narrow, 8 to 10 mm. long; glumes about 4 mm. long; lemmas obtuse, about 4 mm. long, entire or slightly emarginate, awnless.—Dry slopes and gravelly banks, Silver Mt., Alpine Co.; e. to Col. and Tex.

76. Triodia pulchella H.B.K.; spikelets x 5.

2. **T. pulchélla** H.B.K. Fig. 76. Low and tufted, usually not over 1.5 dm. high; culms slender, scabrous or puberulous, consisting of 1 long internode, bearing at the top a fascicle of leaves, the fascicle finally bending over to the ground, taking root and producing other culms, the fascicles also producing the inflorescence; sheaths striate, papery-margined, pilose at base; blades involute, short, scabrous, sharp-pointed, striate; panicles much reduced, consisting of 1 to 5 nearly sessile spikelets 8 to 10 mm. long; glumes subequal, broad, acuminate, awn-pointed, 6 to 8 mm. long; lemmas 4 mm. long, long-pilose below, cleft about half way, the awn about as long or a little longer than the obtuse lobes. —Mesas and rocky hills: Death Valley region; Mohave and Colorado deserts; e. to Utah and Tex., s. to Mex.

19. **ORCÚTTIA** Vasey

Low cespitose annuals, with short blades and simple spike-like panicles; spikelets relatively large, appressed, the upper aggregate, the lower more or less remote. Spikelets several-flowered, the upper florets reduced; rachilla persistent, continuous, the florets falling away, or tardily disarticulating. Glumes nearly equal, shorter than the lemmas, broad, irregularly 2 to 5-toothed, many-nerved, the nerves extending into the teeth. Lemmas firm, prominently 13 to 15-nerved, the broad summit with 5 long teeth or with numerous short teeth. Palea broad, as long as the lemma. (C. R. Orcutt, a naturalist of San Diego.)

Lemmas toothed; blades pilose on upper surface...
1. *O. greenei.*
Lemmas several-awned; blades not pilose.....
2. *O. californica.*

1. **O. grèenei** Vasey. Fig. 77. Culms 1.5 to 2 dm. high, scabrous or appressed-pilose, especially at the nodes; sheaths finely papillose, shorter than the internodes, the ligule very short; blades about 2.5 cm. long, inrolled; panicle 2.5 to 7.5 cm. long, pale;

77. Orcuttia greenei Vasey; *a*, habit x ½; *b*, spikelet x 2; *c*, floret in bloom x 2.

spikelets about 1.2 cm. long; glumes and lemmas sparsely long-pilose, more or less papillose, the glumes 4 mm., the lemmas 6 mm. long.—Moist plains near Chico, the only known locality.

2. **O. califórnica** Vasey. Culms 5 to 10 cm. high, erect, smooth; sheaths and blades smooth, the latter 1 to 2 cm. long, mostly basal; panicle 2 to 6 cm. long, the spikelets distant below, contiguous above; spikelets about 1 cm. long; glumes 4 to 5 mm. long; lemmas 5 mm. long, the teeth acuminate, awn-tipped.—Goose Valley, Shasta Co.; San Quentin Bay, L. Cal.

Tribe 2. **Hórdeae.** Barley Tribe

Spikelets 1 to several-flowered, the rachilla usually disarticulating above the glumes and between the florets, sessile on opposite sides of a jointed or continuous axis forming symmetrical (not one-sided) spikes. (Wheat, rye, and barley belong to this tribe.)

20. **AGROPYRON** Gaertn. Wheat Grass

Our species perennial, often with creeping rhizomes, with usually erect culms and narrow spikes. Spikelets several-flowered, solitary (or rarely in pairs), placed flatwise at each joint of a continuous (rarely disarticulating) rachis. Glumes equal, firm, several-nerved, usually shorter than the first lemma, acute or awned, rarely obtuse or notched. Lemmas convex, rather firm, 5 to 7-nerved, usually acute or awned from the apex. Palea shorter than the lemma. (Greek agros, field, and puros, wheat.)

Plants with creeping rhizomes, forming tough sod.
- Lemmas not awn-pointed, more or less pubescent ..... 1. *A. dasystachyum.*
- Lemmas awn-tipped or long-awned ..... 2. *A. smithii.*

Plants without rhizomes; bunch-grasses.
- Lemmas awn-tipped.
  - Nodes appressed-pubescent ..... 3. *A. parishii.*
  - Nodes glabrous ..... 4. *A. tenerum.*
- Lemmas long-awned.
  - Awn straight or nearly so; blades flat.
    - Spikelets distant, scarcely reaching the one above on the opposite side ..... 5. *A. laeve.*
    - Spikelets overlapping ..... 6. *A. caninum.*
  - Awns strongly divergent at maturity.
    - Glumes acute ..... 7. *A. spicatum.*
    - Glumes distinctly awned
      - Rachis not disjointing at maturity; glumes 3 to 5-nerved. 8. *A. pringlei.*
      - Rachis disjointing at maturity; glumes 2-nerved ..... 9. *A. saxicola.*

1. **A. dasystàchyum** (Hook.) Scribn. Northern Wheat Grass. Culms 4.5 to 9 dm. high; blades narrow, mostly involute, scabrous; spike erect, 5 to 12 cm. long; spikelets few-flowered, 10 to 12 mm. long; glumes lanceolate the first narrow, 3 to 5-nerved, 8 mm. long, the second broader, 5 to 7-nerved, 9 mm. long; lemmas 8 to 10 mm. long, acute.—Dry or sandy soil, Lassen Co.; n. to Wash. and Saskat., e. to Col. In typical form the lemmas are conspicuously pubescent. Cal. plants mostly have minutely pubescent lemmas. (A. subvillosum E. Nels.)

2. **A. smíthii** Rydb. Colorado Bluestem. Plant usually tall, glaucous; rhizomes pale; culms 3 to 15 dm. high, rigid; blades bluish green, scabrous, striate, usually becoming involute; spikelets 7 to 13-flowered, 1.2 to 1.5 cm. long, somewhat distant, glabrous or nearly so, acute, compressed, rarely in pairs; glumes acuminate, ½ to ⅔ as long as spikelet, the nerves usually faint; lemmas mucronate or awn-pointed, hard, faintly nerved.—Dry especially alkaline soil, Modoc Co.; n. to Wash., e. to Mich. and Kan.

A. rèpens (L.) Beauv., Quack Grass, a troublesome weed of the e. U. S., with thinner flat blades, sparingly pilose on the upper surface, and yellowish rhizomes, has been found near San Francisco and in S. Cal.

3. **A. párishii** Scribn. & Sm. Culms 9 to 12 dm. high; blades flat; spike narrow, as much as 3 dm. long; spikelets narrow, distant, mostly shorter than the internodes of the rachis, about 2 cm. long; glumes several-nerved, acute, more than ½ as long as spikelet; lemmas smooth, faintly nerved.—Pico Blanco, Santa Lucia Mts.; San Bernardino Mts.; the only known localities.

4. **A. ténerum** Vasey. SLENDER WHEAT GRASS. Culms erect, tufted, 6 to 12 dm. high; blades narrow, flat or involute; spike cylindric, slender, erect, 10 to 15 cm. long; glumes firm, nearly as long as the spikelet, gradually tapering into an awned point.—Open woods, rocky slopes and valley plains, widely scattered through the state; n. to Alas., e. to Labrador and Col.

5. **A. laève** (Scribn. & Sm.) Hitchc. Culms 12 to 15 dm. high; blades flat; spike as much as 30 cm. long; spikelets 1.5 to 2 cm. long; glumes obtuse, several-nerved, 8 to 10 mm. long; lemmas 10 to 12 mm. long; awn 1.5 to 3 cm. long.—Mts. of cismontane S. Cal.; Fresno and Amador Cos. in the Sierra Nevada.

78. Agropyron caninum Beauv.; habit x ¼.

6. **A. caninum** (L.) Beauv. Fig. 78. Culms erect, 3 to 9 dm. high; blades flat, rather lax, 2 to 6 mm. wide, scabrous; spike more or less nodding, rather dense, 7 to 16 cm. long; spikelets 1.2 to 1.5 cm. long; glumes pointed or awned; lemmas 3 to 5-nerved; awn straight, or somewhat spreading, once or twice the length of the lemma.—Dry hillsides and mt. meadows: San Gabriel Mts.; Santa Lucia Mts.; Sierra Nevada; n. to Alas., e. to N. Eng.

7. **A. spicàtum** (Pursh) Scribn. & Sm. BUNCH WHEAT GRASS. Culms slender 4.5 to 9 dm. high, in dense clumps; blades narrow, involute, erect, smooth; spike slender, 5 to 10 cm. long; spikelets rather distant, 1 to 1.5 cm. long; glumes 6 to 10 mm. long, acute but not awned, scarious at margins and tip, strongly 3 to 5-nerved; lemmas faintly nerved; awn slender, 1 to 2 cm. long.—Plains and dry hills, Lassen Co. to Modoc and Siskiyou Cos.; n. to Yukon Terr., e. to Col. Smaller plants of arid ground, with more wiry culms and smaller blades and spikelets, are the forms described as A. vaseyi Scribn. & Sm.

8. **A. prínglei** (Scribn. & Sm.) Hitchc. Culms 3 to 4.5 dm. high; blades usually flat, short; spike 5 to 10 cm. long; glumes lanceolate, ending in a short straight awn; lemmas with stout horizontally spreading awns about 2 cm. long.—Gravelly slides and rocky slopes, 7000 to 12,000 ft., Sierra Nevada from Sierra Co. to Tulare Co.

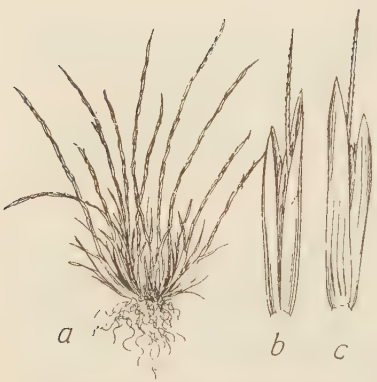
9. **A. saxícola** (Scribn. & Sm.) Piper. Culms 4.5 to 9 dm. high, slender; sheaths smooth; blades short, flat or loosely involute; spike 7.5 to 10 cm. long, flexuous, long-exserted; spikelets sometimes in pairs; glumes subulate or narrowly lanceolate, mostly 2-nerved, narrowed into a slender spreading awn 1.5 to 2.5 cm. long; lemmas 8 mm. long, smooth and rounded below, 5-nerved and somewhat scabrous above, the slender spreading awn about 2.5 cm. long.—Dry mt. slopes, 9000 ft., Mt. Dana; n. to Wash. and Ida. This approaches Sitanion. The small form with spreading culms was described as A. scribneri Vasey.

A. JÚNCEUM (L.) Beauv., of the Mediterranean coasts, with creeping rhizomes, involute blades, stout spike, readily disarticulating at the joints, and large spikelets with obtuse glumes and lemmas, has been found near San Francisco, probably on ballast.

TRITICUM (Wheat) and SECALE (Rye) differ from Agropyron in being annuals, the first with ovate 3 to several-nerved glumes and broad lemmas, the second with subulate 1-nerved glumes, and narrow lemmas.

21. **SCRIBNÈRIA** Hack.

Low annual with slender cylindric spikes. Spikelets 1-flowered, solitary, appressed and lateral to the somewhat thickened continuous rachis, the rachilla prolonged as a very minute hairy stipe. Glumes equal, narrow, firm, acute, keeled on the outer nerves, the first 2-nerved, the second 4-nerved; floret with short hairs at the base. Lemma shorter than the glumes, membranaceous, rounded on the back, obscurely nerved, the apex shortly bifid,



79. Scribneria bolanderi Hack.; *a*, habit x ⅓; *b*, *c*, spikelet (2 views) x 5.

the lobes obtuse, the faint midnerve extending as a slender straight awn. Palea about as long as the lemma. (F. Lamson-Scribner, eminent American agrostologist.)

1. **S. bolánderi** (Thurb.) Hack. Fig. 79. Culms 0.8 to 3 dm. high, tufted, erect or ascending; spike slender, about 1 mm. thick, the joints 4 to 5 mm. long. —Sandy or sterile ground, 3000 to 4000 ft., Sierra Nevada from Fresno Co. to Tuolumne Co.; n. to Wash. Rare.

22. ÉLYMUS L. Wild Rye

Erect, usually rather tall, mostly perennials, with flat or rarely convolute blades and erect or nodding spikes, the spikelets usually crowded, 2 to 6-flowered, in pairs (rarely 3 or more or solitary) at each node of a continuous rachis, the florets dorsiventral to the rachis. Glumes equal, usually rigid, sometimes indurate below, narrow, sometimes subulate, 1 to several-nerved, acute to aristate, somewhat asymmetric and often placed in front of the spikelets. Lemmas rounded on the back or nearly terete, obscurely 5-nerved, acute or usually awned from the tip. (Greek elumos, ancient name for a kind of millet.)

Plants annual; spikes few-flowered, awns of lemma 5 to 10 cm. long..1. *E. caput-medusae*
Plants perennial; spikes many-flowered; awns less than 4 cm. long.
  Plants with slender rhizomes, forming sod.
    Glumes lanceolate, scabrous to pubescent.
      Glumes about 2 cm. long; lemmas distinctly nerved.....2. *E. mollis.*
      Glumes 1 to 1.5 cm. long; lemmas faintly nerved except at apex.....
        3. *E. vancouverensis.*
    Glumes subulate or very narrow, glabrous.....4. *E. triticoides*
  Plants without rhizomes (short thick ones in no. 6), forming clumps.
    Glumes subulate; plants robust.
      Plants cinereus-pubescent.....5. *E. cinereus.*
      Plants glabrous or scabrous, not cinereus.....6. *E. condensatus.*
    Glumes not subulate, lanceolate or narrower, nerved.
      Spike slender and dense, 4 to 5 mm. thick; blades mostly less than 4 mm. wide.....9. *E. macounii.*
      Spike 10 mm. or more thick; blades 5 to 15 mm. wide.
        Awns flexuous-spreading.....10. *E. canadensis.*
        Awns straight, erect or nearly so.
          Sheaths glabrous.
            Glumes and lemmas acuminate or mucronate..7. *E. virescens.*
            Glumes and lemmas distinctly awned.....8. *E. glaucus.*
          Sheaths pubescent; var. jepsonii of.....8. *E. glaucus.*

1. **E. càput-medùsae** L. Culms branched at base, erect or decumbent at base, slender, 2 to 6 dm. high; blades narrow, short; spike nodding; glumes awl shaped, smooth, indurate below, narrowed into a slender awn 1.5 to 2.5 cm. long; lemmas lanceolate, 3-nerved, 6 mm. long, very scabrous, gradually narrowed into a flat, spreading awn.— Open ground: Los Gatos; Klamathon, Siskiyou Co.; nat. from Eur.

2. **E. móllis** Trin. Sea Lyme Grass. Culms stout, smooth, or pubescent above, glaucous, 6 to 12 dm. high; sheaths and blades smooth or the latter scabrous above; spike erect, dense, 7.5 to 25 cm. long; glumes flat, many-nerved, scabrous or pubescent, acuminate, awnless, about as long as the spikelet; lemmas scabrous or felty-pubescent, acuminate or mucronate.— Sand dunes along the coast from Santa Cruz Co. to Mendocino Co.; n. coasts of N. Am. and Eurasia. (E. arenàrius of authors.)

3. **E. vancouverénsis** Vasey. Culms 7.5 to 12 dm. high; blades flat, involute-pointed, 5 to 8 mm. wide, scabrous on the upper surface; spike erect, 10 to 20 cm. long; glumes narrowly lanceolate, firm, sparsely long-villous, especially toward the acuminate apex; lemmas firm, 1 to 1.5 cm. long, acumi-

nate into a short awn.—Sand dunes on the seacoast, Humboldt Bay; n. to Vancouver Isl.

4. **E. tríticoìdes** Buckl. Culms usually glaucous, 6 to 12 dm. high, commonly in large masses, rhizomes extensively creeping, the scales sometimes reddish; blades mostly 2 to 6 mm. wide, flat, or soon involute; spike 10 to 18 cm. long, slender, sometimes branched, 1 to 1.5 cm. long; lemmas 6 to 10 mm. long, glabrous, short-pointed, brownish.—Moist bottomland and alkaline soil throughout the state; n. to Wash., e. to Col. and Ariz. Var. PUBÉSCENS Hitchc. Sheaths and involute blades hirsute-pubescent.—Griffin, n. Ventura Co.

5. **E. cinèreus** Scribn. & Merr. Culms erect, stout, puberulent, 12 to 15 dm. high; blades indurate, pointed; spike erect, 15 to 20 cm. long, dense, interrupted below; spikelets 1.4 to 2 cm. long, scabrous-pubescent; glumes about 1.5 cm. long; lemmas faintly nerved, obtuse, mucronate or awn-tipped. —Mohave Desert (Lancaster) and Inyo Co.; e. to Nev.

6. **E. condensàtus** Presl. GIANT RYE GRASS. Culms in large clumps, stout, 9 to 18 dm. high, producing stout knotty rhizomes; blades flat, as much as 2 cm. wide; spike erect, usually dense, 15 to 30 cm. long, sometimes branched; spikelets 1.2 to 2 cm. long; glumes awn-pointed, usually 1-nerved, or nerveless, about as long as the first lemma; lemmas awnless or mucronate.—Dry plains and hillsides and along gullies and ditches: South Coast Ranges near the coast; S. Cal.; e. to Neb., n. to Alb. and B. C. Var. PÙBENS Piper. Sheaths and blades pubescent.—Santa Barbara; also in Wash.

7. **E. viréscens** Piper. Fig. 80. Culms erect, 3 to 6 dm. high, glabrous, glaucous; spike erect, 7.5 to 10 cm. long, closely flowered; spikelets, 1 to 3-flowered; glumes 1 to 1.5 cm. long, prominently several-nerved, the nerves scarious; lemmas firm, indistinctly nerved.—Damp soil, woods or open ground, at scattered stations near the coast: San Diego Co.; Mt. Tamalpais; n. to Alas.

80. Elymus virescens Piper; *a*, habit x ⅓; *b*, glumes x 2; *c*, florets x 2.

8. **E. glaúcus** Buckl. WESTERN RYE GRASS. Culms erect, 6 to 12 dm. high; blades flat (rarely more or less involute), 5 to 10 mm. wide, scabrous on both surfaces; spike somewhat nodding, usually dense, long-exserted, 5 to 15 cm. long, rarely longer; spikelets 1 to 1.2 cm. long; glumes about as long as the spikelet, lanceolate, with 2 to 4 scabrous nerves; awn of lemma 1 to 2 times as long as the body.—Open woods, copses, and dry hillsides, throughout the state; n. to Alas., e. to Mich. and Mo. Var. JEPSÒNII Davy. Distinguished by the more or less pubescent sheaths and blades.—Dry woods and ravines, Napa Valley. The species is exceedingly variable. A short-awned form with scabrous to pubescent sheaths was described as E. pubescens Davy; a short-awned form with glabrous sheaths as var. breviaristatus Davy; a form with lemmas hispidulous toward the apex as E. hispidulus Davy; a narrow-leaved form as E. angustifolius Davy. E. divergens Davy is a form of var. jepsonii with somewhat spreading awns. These names represent specimens rather than recognizable forms.

9. **E. macoùnii** Vasey. Culms tufted, erect, slender, 4.5 to 9 dm. high; blades erect, rather firm, usually scabrous on both surfaces; spike erect or nearly so, 5 to 10 cm. long; spikelets narrow, closely appressed; glumes narrowly lanceolate, scabrous, short-awned; lemmas scabrous toward the apex, tapering into a straight awn 1 to 1.5 cm. long.—Meadows and open ground in drier regions, east of the Sierra Nevada crest from Nevada Co. to Siskiyou Co.; n. to B. C., e. to Minn. and N. Mex.

10. **E. canadénsis** L. Culms in large clumps, rather robust, 9 to 13.5 dm. high; blades flat, spreading, scabrous at least on the upper surface, 5 to 15

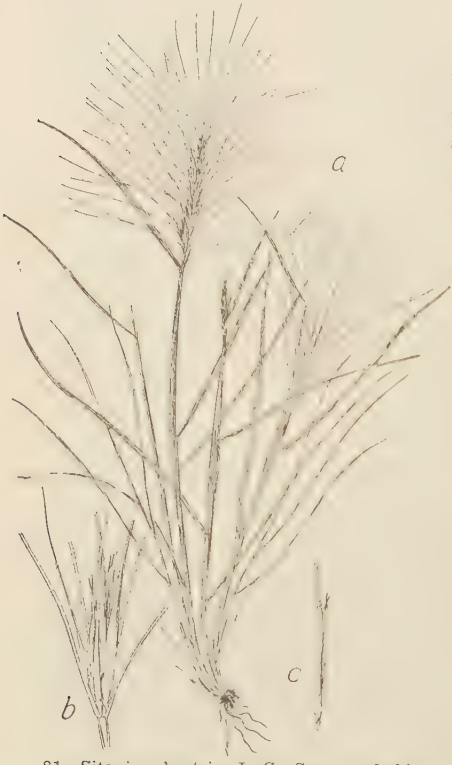
mm. wide; spike thick, nodding, usually interrupted below, 10 to 20 cm. long, bristly with the numerous spreading awns; spikelets slightly spreading; glumes narrow, scabrous, awned; lemmas scabrous-pubescent, about 1 cm. long, tapering into an awn 2 to 3 cm. long.—Moist copses, wood-borders and shaded banks, Sonoma Co.; throughout temperate N. Am.

23. **SITÀNION** Raf.

Low or rather tall cespitose perennials, with bristly spikes. Spikelets 2 to few-flowered, the uppermost floret reduced, usually 2 at each node of a disarticulating rachis, the rachis breaking at the base of each joint, remaining attached as a pointed stipe to the spikelets above. Glumes narrow or setaceous, 1 to 3-nerved, the nerves prominent, extending into one to several awns, these (when more than one) irregular in size, sometimes mere lateral appendages of the long central awn, sometimes equal, the glume being bifid. Lemmas firm, nearly terete, the apex slightly 2-toothed, 5-nerved, the nerves obscure, the central nerve extending into a long slender finally spreading awn, sometimes one or more of the lateral nerves also extending into short awns. Palea firm, nearly as long as the body of the lemma. (Greek sitos, grain for food.)

Glumes or some of them 3-nerved, lanceolate, entire or sometimes bifid.
- Plant glabrous ..... 1. *S. hanseni.*
- Plant pubescent ..... 2. *S. anomalum.*

Glumes subulate or very narrow, 1 or mostly 2-nerved, entire or cleft into 2 to several lobes.
- Glumes cleft into 3 to several lobes ..... 3. *S. jubatum.*
- Glumes entire or 2-cleft ..... 4. *S. hystrix.*



81. Sitanion hystrix J. G. Sm.; *a*, habit x ⅓; *b*, joint of spike x 2½; *c*, floret x 2½.

1. **S. hánseni** J. G. Sm. Culms rather slender, loosely tufted 6 to 10 dm. high; sheaths smooth; blades flat or involute; spike rather slender, 5 to 8 cm. long; glumes narrowly lanceolate, some of them 1-nerved and entire, others broader and 3-nerved, often bifid; lemmas smooth, scabrous toward apex, 8 mm. long; awns erect, about 2.5 cm. long.—Open woods and rocky slopes, 2000 to 3000 ft.: Temescal Mts., w. Riverside Co.; Santa Lucia Mts.; Amador Co.; n. to Wash., e. to Utah.

2. **S. anómalum** J. G. Sm. Differs from no. 1 in having more or less pubescent culms, sheaths and blades, and usually narrower blades, especially those of the numerous innovations.—Dry woods and rocky slopes: Templeton, San Luis Obispo Co.; Scotts Valley, Lake Co.; n. to Wash.

3. **S. jubàtum** J. G. Sm. Culms erect, 3 to 6 dm. high, rarely taller; sheaths smooth, scabrous or villous-pubescent; blades flat, often becoming involute, smooth or usually more or less pubescent, at least on upper surface, usually not over 3 mm. wide; spike erect, dense, 2.5 to 8 cm. long, thick and bushy from the numerous long awns; glumes split into 3 or more lobes or divisions, each extending into a long awn; lemmas mostly 8 to 10 mm. long, the awns and those of the glumes 4 to 10 cm. long.—Rocky or brushy hillsides and open

dry woods and plains, widely scattered throughout cismontane Cal.; n. to Wash. Exceedingly variable, in size, pubescence and length of awns. Several names have been based on these characters but they are found to be too inconstant to be distinguished even as varieties. S. breviaristatum J. G. Sm. is a shorter awned plant.

4. **S. hýstrix** (Nutt.) J. G. Sm. Fig. 81. Culms tufted, erect, rather stiff, 3 to 4.5 dm. high; sheaths glabrous to softly pubescent; blades flat or involute, glabrous or puberulent below, usually puberulent above, sometimes softly pubescent all over, rather stiffly ascending or somewhat spreading, 1 to 3 (rarely as much as 5) mm. wide; spike erect, 2 to 7 (rarely 10) cm. long; glumes almost subulate, 1 or 2-nerved, extending into a slender scabrous awn, sometimes bifid at the middle, or with a bristle on one margin; lemmas smooth or scabrous, extending into a slender awn, the awns of glumes and lemmas 2 to 7 cm. long.—Dry hills, plains, open woods, and rocky slopes, S. Cal. mts., n. through the desert ranges and Sierra Nevada to Siskiyou Co., less common in the Coast Ranges; n. to Wash., e. to Kan. Parallels no. 3 in variability. At high altitudes the plants are dwarf. (S. californicum J. G. Sm., S. minus J. G. Sm., S. glabrum J. G. Sm.)

24. **HÝSTRIX** Moench

Erect perennials with flat blades and bristly loosely-flowered spikes. Spikelets 2 to 4-flowered, 1 to 3 at each node of a continuous flattened rachis, spreading at maturity. Glumes reduced to short or minute awns, the first usually obsolete, both often wanting in the upper spikelets. Lemmas convex, rigid, tapering into long awns, 5-nerved, the nerves obscure except toward the tip; palea about as long as the body of the lemma. (Greek hustrix, porcupine.)

1. **H. califórnica** (Boland.) Kuntze. Fig. 82. Culms stout, 10.5 to 18 dm. high; sheaths hispid or the upper smooth; blades flat, as much as 2 cm. wide, scabrous; spike stout, dense and somewhat nodding above, more or less interrupted below, 12 to 25 cm. long; spikelets mostly in pairs, 1 to 3-flowered, on short callus-like pedicels; lemmas 1.2 to 2 cm. long 5-nerved above, the nerves, especially the marginal, ciliate-hispid; awn stout, straight, rough, 2 to 3 cm. long.—Woods and shaded banks near the coast, Marin Co. to Santa Cruz Co.

82. Hystrix californica Kuntze; habit x ⅓.

25. **HÓRDEUM** L. Wild Barley

Annual or perennial low or rather tall grasses, with flat blades and dense terminal cylindric spikes. Spikelets 1-flowered, 3 (sometimes 2) together at each node of the articulate rachis (continuous in H. vulgare, cultivated barley), the back of the lemma turned from the rachis, the middle one sessile or subsessile, the lateral ones pediceled. Rachilla in the central spikelet prolonged behind the palea as a bristle and sometimes bearing a rudimentary floret; lateral spikelets usually imperfect, sometimes reduced to bristles. Glumes narrow, often subulate and awned, rigid, standing in front of the spikelet. Lemmas rounded on the back, 5-nerved, usually obscurely so, tapering into a usually long awn. (Ancient Latin name for barley.)

Plants annual.
- Glumes or some of them ciliate.....1. *H. murinum.*
- Glumes not ciliate.
  - Glumes of the fertile spikelet dilated above the base.....2. *H. pusillum.*
  - Glumes not dilated.
    - Glumes glabrous or nearly so.....3. *H. gussoneanum.*
    - Glumes very scabrous.....4. *H. depressum.*

Plants perennial.
- Awns mostly 4 to 5 cm. long.....5. *H. jubatum.*

Awns not over 1 cm. long.
Spikes rather stout, the central florets rather prominent on each side of the spike; culms 50 to 100 cm. tall.....7. *H. boreale.*
Spikes slender, the awns obscuring the fertile central florets; culms mostly less than 50 cm. tall.....6. *H. nodosum.*

1. **H. murìnum** L. WALL BARLEY. FARMER'S FOXTAIL. Culms bushy-branched, spreading; sheaths and blades smooth; spike 5 to 8 cm. long, often partly enclosed in the uppermost inflated sheath; glumes of the central spikelet narrowly spindle-form, 3-nerved, long-ciliate on both margins, the nerves scabrous; awn about 2.5 cm. long; glumes of the lateral spikelets unlike, the inner similar to the central, the outer setaceous, not ciliate; lemmas all broad, 8 to 10 mm. long, the awns somewhat exceeding those of the glumes.—Fields, waste places and open ground, very common and abundant; nat. from Eur.

2. **H. pusíllum** Nutt. Culms 1 to 3.8 dm. high; blades erect, flat; spike erect, 2.5 to 5 cm. long, about 1 cm. wide; lateral pair of spikelets reduced, the first glume of each and both glumes of the fertile spikelet dilated above the base, attenuate into a slender awn 8 to 12 mm. long; glumes very scabrous; lemma awnless.—Plains and open, especially alkaline ground, S. Cal.; e. to Ohio.

3. **H. gussoneànum** Parl. Culms numerous, spreading or geniculate at base, 1.5 to 3.8 dm. high; sheaths and flat blades, especially the lower, more or less pubescent; spike erect, oblong, 1.5 to 4 cm. long, about 10 mm. wide, rounded at base; glumes setaceous, about 1.5 cm. long; lemma of lateral spikelets reduced, the awn 2 to 3 mm. long; lemma of central spikelets 5 mm. long, the awn somewhat longer than the glumes.—Fields and waste places, common in cent. Cal., rare in S. Cal.; nat. from Eur.

83. Hordeum jubatum L.; *a*, habit x ¼; *b*, joint of spike x 3.

4. **H. depréssum** (Scribn. & Sm.) Rydb. Culms erect or geniculate at base, 1.5 to 3.5 dm. high; blades pubescent; spike 2 to 4 cm. long; glumes subulate; central spikelet as in no. 3, the awns longer; lemma of lateral spikelets awnless. — Open ground, rare: Blacks sta., Yolo Co.; Wash. to Ida., and Ariz.

5. **H. jubàtum** L. SQUIRREL-TAIL BARLEY. Fig. 83. Culms erect, or decumbent at base, 3 to 6 dm. high; blades scabrous; spike nodding, 5 to 10 cm. long, about 2.5 cm. wide, soft; lateral pair of spikelets each reduced to 1 to 3 spreading awns; glumes of perfect spikelets awn-like, spreading; lemma 6 to 8 mm. long, with the awn as long as the glumes.—Open ground, fields and waste places: Los Angeles; San Bernardino Mts.; Victorville; Suisun Marshes; Honey Lake Valley; n. to Alas., e. to Ontario and Md.

6. **H. nodòsum** L. MEADOW BARLEY. Culms tufted, erect or geniculate-ascending, 1.5 to 6 dm. high; blades relatively short and erect; spike slender, 2 to 8 cm. long; glumes all setaceous, 8 to 15 mm. long; floret of lateral spikelets much reduced.—Meadows and open ground throughout the state; n. to Alas., e. to Ind.; also Eur.

7. **H. boreàle** Scribn. & Sm. NORTHERN BARLEY. Similar to no. 6, on the average taller, with longer, laxer blades and thicker spikes, the awns of lateral spikelets somewhat spreading.—Along the coast, Mendocino and Humboldt Cos.; n. to Alas.

26. **LÒLIUM** L. RYE GRASS

Annuals or perennials, with flat blades and simple terminal flat spikes. Spikelets several-flowered, solitary, placed edgewise to the continuous rachis, one edge fitting to the alternate concavities. First glume wanting (except on the terminal spikelet), the second outward, strongly 3 to 5-nerved, equaling or exceeding the second floret. Lemmas rounded on the back, 5 to 7-nerved, obtuse, acute, or awned. (Ancient Latin name.)

Glume shorter than the spikelet; perennial.
Lemmas awned.....1. *L. multiflorum.*
Lemmas nearly or quite awnless.....2. *L. perenne.*
Glume as long or longer than the spikelet; annual.....3. *L. temulentum.*

1. **L. multiflòrum** Lam. ITALIAN OR AUSTRALIAN RYE GRASS. Short-lived perennial; culms 3 to 6 dm. high, erect or often decumbent at base, often rough below the spike and on the convex side of the rachis; spike nodding, as much as 30 cm. long; spikelets 1.5 to 2.5 cm. long, much exceeding the glume, 10 to 20-flowered; lemmas 7 to 8 mm. long, the lower short-awned or awnless.—Roadsides and waste places, common, mostly in the Coast Ranges; introd. from Eur. Frequently cult. for lawns and as meadow or pasture grass.

84. Lolium perenne L.; habit x ⅓.

2. **L. perénne** L. PERENNIAL OR ENGLISH RYE GRASS. Fig. 84. Resembling no. 1, but usually more slender, with narrower glossy blades and smaller spikes; culms and convex side of rachis smooth; spikelets usually 8 to 10-flowered, not much exceeding the glume; lemmas smaller, awnless.—Roadsides and waste places, rare; introd. from Eur. Sometimes cult. as a lawn or pasture grass. Var. TÉNUE Kunth. Blades narrow, folded, firm, erect; spikes slender, the spikelets few-flowered.—Siskiyou Co.; nat. from Eur.

3. **L. temuléntum** L. DARNEL. CHEAT. Culms 6 to 9 dm. high; spikes stout, strict, 12 to 20 cm. long; glume 1.5 to 2.5 cm. long, equaling the 5 to 7-flowered spikelet, firm, pointed, conspicuous; lemmas 6 to 8 mm. long, obtuse, awned; awn as much as 8 mm. long.—Fields and waste places, rather common; nat. from Eur. Var. ARVÉNSE Bab. Differs in having awnless spikelets.—Less common than the species; nat. from Eur.

L. SUBULÀTUM Vis. Spikelets partly sunken in the excavations of the rachis and partly hidden by the appressed obtuse strongly nerved glumes; lemmas 5 mm. long.—Ballast and waste ground, rare; nat. of Eur.; cult. under the name of Winnera Rye Grass.

27. **LEPTÙRUS** R. Br.

Low annuals or perennials with hard cylindric spikes. Spikelets 1-flowered, embedded in the hard, cylindric, articulate rachis, placed edgewise thereto, the first glume wanting except on the terminal spikelet, the second glume closing the cavity of the rachis and flush with the surface, indurate, nerved, acuminate, longer than the joint of the rachis. Lemma hyaline, shorter than the glume, 3-nerved. Palea hyaline, a little shorter than the lemma. Spikelet falling entire, attached to its rachis joint. (Greek leptos, slender, and oura, tail.) (Monerma Beauv.)

1. **L. cylíndricus** (Willd.) Trin. Fig. 85. Culms bushy-branched, spreading or prostrate, 1 to 3 dm. high; spike curved; glume 6 mm. long, acuminate.—Mudflats and salt marshes, San Francisco Bay to San Diego; nat. from Eur.

85. Lepturus cylindricus Trin.; sect. infl. x 2.

28. **PHOLIÙRUS** Trin.

Low annuals with cylindric spikes. Spikelets 1 or 2-flowered, embedded in the articulate rachis and falling attached to the joints. Glumes two, placed in front of the spikelet and inclosing it, coriaceous, 5-nerved, acute, asymmetric, appearing like halves of a single split glume. Lemma lying next to the axis, smaller than the glumes, hyaline, keeled, scarcely more than 1-nerved. Palea a little shorter than the lemma, hyaline. (Greek pholis, scale of a serpent, and oura, tail.) (Lepturus of authors, not R. Br.)

86. Pholiurus incurvus Schinz & Thell.; habit x ½.

1. **P. incurvus** (L.) Schinz & Thell. Fig. 80. Culms tufted, decumbent at base, 1 to 2 dm. high; blades short and narrow; spike long, conspicuously flexuous; glumes 7 mm. long, pointed.—Mudflats and salt marshes, Marin Co. to San Diego; nat. from Eur.

Tribe 3. **Avèneae.** Oat Tribe

Spikelets 2 to several-flowered, in open or contracted panicles (rarely in racemes, solitary in Danthonia unispicata); rachilla usually disarticulating above the glumes and between the florets; glumes usually as long as or longer than the first lemma, commonly longer than all the florets; lemmas usually awned from the back or from between the teeth of a bifid apex, the awn bent, often twisted, the callus and rachilla joints usually villous.

29. **KOELÈRIA** Pers.

Annuals or perennials, slender, low or rather tall, with narrow blades and spike-like panicles. Spikelets 2 to 4-flowered, compressed; rachilla prolonged beyond the florets as a slender bristle or bearing a reduced or sterile floret at the tip. Glumes usually about equal in length, the lower narrower and sometimes shorter, 1-nerved, the upper somewhat broader above the middle, 3 to 5-nerved. Lemmas somewhat scarious and shining, the lowermost a little longer than the glume, obscurely 5-nerved, acute or short-awned, the awn, if present, borne just below the apex. (G. L. Koeler, author of a work on European grasses.)

Plants perennial; culm puberulent below panicle..... 1. *K. cristata.*

Plants annual; culm glabrous below panicle..... 2. *K. phleoides.*

87. Koeleria cristata Pers.; *a*, habit x ½; *b*, spikelet x 2; *c*, spikelet displayed x 2.

1. **K. cristàta** (L.) Pers. Fig. 87. Culms erect, 3 to 6 dm. high, the sheaths pubescent, at least the lower; blades mostly basal, rather short; panicle compact, shining, pointed, 5 to 10 cm. long, often interrupted at base; spikelets 4 to 5 mm. long; glumes and lemmas scabrous.—Plains and open woods, mostly in the Coast Ranges and S. Cal. mts.; extends throughout cooler parts of n. hemisphere. Var. LONGIFÒLIA Vasey. Taller, with longer blades, the basal as much as 3 dm. long, and larger looser panicles.—Open woods, Coast Ranges.

2. **K. phleoìdes** (Vill.) Pers. Culms 1.5 to 3 dm. high; panicle 2.5 to 7 cm. long, obtuse, spikelets 2 to 4 mm. long; glumes smooth, acute, the

first narrower; lemmas smooth, short-awned from a bifid apex.—Open ground, San Joaquin, Butte and Lassen Cos.; nat. from Eur.

30. **TRISÈTUM** Pers.

Tufted perennials with flat blades and open or usually contracted or spike-like panicles. Spikelets usually 2-flowered, sometimes 3 to 5-flowered, the rachilla prolonged behind the upper floret, usually villous. Glumes somewhat unequal, acute, awnless, the second usually longer than the first floret. Lemmas usually short-bearded at the base, 2-toothed at the apex, the teeth often awned, bearing from the back below the cleft apex a straight and included, or usually bent and exserted, awn. (Latin tres, three, and seta, bristle.)

Awn included or wanting.....1. *T. wolfii.*
Awn exserted.
  Panicle loose and open, the branches naked at base.....2. *T. cernuum.*
  Panicle narrow or compact.
    Panicle narrow but loose; blades flat, usually 5 to 11 mm. wide..3. *T. canescens.*
    Panicle spike-like.
      Sheaths pubescent.....4. *T. spicatum.*
      Sheaths glabrous.....5. *T. sesquiflorum.*

1. **T. wólfii** Vasey. Culms smooth, erect, 3 to 6 dm. high; sheaths smooth or sparsely retrorse-pilose; blades flat, erect, 2 to 4 mm. wide, scabrous or more or less pilose; panicle narrow, usually spike-like, 5 to 10 cm. long; glumes about 6 mm. long, scabrous on the keel, subequal, the first 1-nerved or obscurely 3-nerved, the second 3-nerved; lemmas scaberulous, the lower 4 mm. long, the awn reduced to a bristle scarcely reaching the tip, or on the upper lemma obsolete, the teeth acute, not aristate.—Meadows in the higher Sierra Nevada from Fresno Co. to Eldorado Co.; n. to Wash., e. to Col. (T. brandegei Scribn.)

2. **T. cérnuum** Trin. Culms rather lax, 6 to 12 dm. high; sheaths smooth; blades thin, flat, lax, scabrous, 6 to 12 mm. wide; panicle lax, drooping, 15 to 30 cm. long, the branches verticillate, slender, flexuous, spikelet-bearing toward the ends; spikelet 6 to 12 mm. long with usually 3 distant florets, the first longer than the second glume; glumes very unequal, the first narrow, acuminate, 1-nerved, 1 mm. long, the second broad, 3-nerved, 3 to 4 mm. long; lemmas with setaceous teeth, and slender spreading awn 1 to 1.5 cm. long.—Moist woods, Mendocino and Humboldt Cos.; n. to Alas. and Mont.

3. **T. canéscens** Buckl. Culms erect, or decumbent at base, 6 to 12 dm. high; sheaths more or less retrorse-pilose, at least the lower, often also canescent; blades flat, scabrous or canescent; panicle loose, sometimes interrupted and spike-like, 10 to 20 cm. long; glumes smooth, except the keel, strongly unequal, the first narrow, acuminate, 1-nerved, the second broad, acute, 3-nerved, 5 to 7 mm. long; lemmas firm, scaberulous, the upper exceeding the glumes, the teeth aristate; awns geniculate, spreading, twisted below, attached ⅓ below the apex, 10 to 12 mm. long.—Mt. meadows, moist ravines, and along streams: Sierra Nevada; Coast Ranges from Santa Cruz Co. to Mendocino Co.; n. to B. C. and Mont.

T. FLAVÉSCENS (L.) Beauv., differing from no. 3 in the relatively broader and more open yellow panicle, has been found at Blue Lake, Humboldt Co.; adv. from Eur.

4. **T. spicàtum** (L.) Richter. Fig. 88. Culms erect, rather stout, 1.5 to 4.5 dm. high, smooth or puberulent; sheaths and usually the blades puberulent; panicle dense, pale or often purple, 5 to 15 cm. long; spikelets 5 to 6 mm. long; glumes somewhat unequal in length, smooth except the keels, the first narrow, acuminate, 1-nerved, the second broader, 3-nerved, acute; lemmas scaberulous, 5 mm. long, the first longer than the glumes, the teeth setaceous; awns geniculate.—A characteristic grass of high

88. Trisetum spicatum Richter; *a*, panicle x ½; *b*, glumes x 5; *c*, florets x 5.

altitudes in the Sierra Nevada, especially above timber-line, found up to the limit of vegetation; also in the high San Bernardino Mts. and San Jacinto Mts.; extends from arctic regions of n. hemisphere southw. in the higher mts. to s. hemisphere.

5. **T. sesquiflòrum** Trin. Resembling no. 4 but differing in having smooth sheaths and blades, the latter usually flat but sometimes involute, and in having wider panicles, and spikelets about 8 mm. long.—Meadows and slopes above timber-line, Sierra Nevada from Tulare Co. to Nevada Co. and n. to Mt. Shasta; far n. to Alas.; also Siberia. (T. congdonii Scribn. & Merr.)

31. **SPHENÓPHOLIS** Scribn.

Perennials with usually flat blades and narrow panicles. Spikelets 2 or 3-flowered, the pedicel disarticulating below the glumes, the rachilla produced beyond the upper floret as a slender bristle. Glumes unlike in shape, the first narrow, acute, 1-nerved, the second broadly obovate, 3 to 5-nerved, somewhat coriaceous. Lemmas firm, scarcely nerved, awnless, the first a little shorter or a little longer than the second glume. (Greek sphen, a wedge, and pholis, a scale.) (Eatonia of authors, not Raf.)

89. Sphenopholis obtusata Scribn. var. lobata Scribn.; *a*, glumes; *b*, floret. x 5.

1. **S. obtusàta** Scribn. var. **lobàta** (Trin.) Scribn. Fig. 89. Culms erect, 3 to 6 dm. high; sheaths and blades scabrous; panicle narrow and compact, often spike-like, more or less interrupted or lobed, especially near base, 5 to 10 cm. long; glumes subequal, the second subcucullate, the broad chartaceous margins smooth and shining.—Plains and open woods, rare in Cal.: San Bernardino; Amador Co.; widely distributed throughout U. S., extending into Can. and Mex.

32. **AVÈNA** L. Oat

Rather tall annuals or perennials, with narrow or open, usually rather few-flowered panicles of usually large spikelets. Spikelets 2 to several-flowered, the rachilla bearded. Glumes about equal, membranaceous or papery, several-nerved, longer than the lower floret, usually exceeding the upper floret. Lemmas indurate, except toward the summit, 5 to 9-nerved, bidentate at the apex, bearing a dorsal bent and twisted awn (this straight and reduced in A. sativa). (The classical Latin name.)

Lemmas glabrous or nearly so.....2. *A. sativa.*
Lemmas pubescent with long, usually brown hairs.
Teeth of lemmas acuminate, not awned.....1. *A. fatua.*
Teeth of lemmas awned.....3. *A. barbata.*

1. **A. fátua** L. Wild Oat. Fig. 90. Culms 3 to 9 dm. high, erect, stout; panicle loose and open, the slender branches usually horizontally spreading; spikelets usually 3-flowered; glumes about 2.5 cm. long; rachilla and lower part of the shining lemma clothed with long stiff brownish hairs; florets readily falling from the glumes; lemma nerved above, about 2 cm. long, awn stout, geniculate, red-brown, twisted below, about 4 cm. long.—Fields and waste places, common, especially in S. Cal.; nat. from Eur. Var. glabràta Peterm. Differs in having nearly or quite glabrous lemmas.—With the species; nat. from Eur.

2. **A. sativa** L. Cultivated Oat. Similar to no. 1; florets not readily separating from the glumes; spikelets usually 2-flowered; lemma glabrous; awn straight, often wanting.—Commonly cultivated and occasionally escaped; native of Eur.

3. **A. barbàta** Brot. Similar to no. 1, spikelets somewhat smaller, mostly 2-flowered, the pedicels curved and capillary; lemma clothed with stiff red hairs, the acuminate teeth ending in fine awns 4 mm. long.—Fields and waste places; nat. from Eur.

90. Avena fatua L.; habit x ¼.

ARRHÈNATHÈRUM ELÀTIUS (L.) Mert. & Koch. Tall Oat Grass. Panicles narrowly pyramidal; spikelets 2-flowered, 7 to 8 mm. long, the lower floret staminate, its lemma bearing a twisted geniculate awn from near the base, the upper floret perfect, its lemma with a short straight awn from just below the tip.—Adv. near Berkeley and at Jackson in Amador Co.; native of Eur.

33. AÌRA L.

Low or rather tall annual or usually perennial grasses with shining pale or purplish spikelets in narrow or open panicles. Spikelets 2-flowered, the hairy rachilla prolonged behind the upper floret, sometimes bearing a reduced floret. Glumes about equal, acute or acutish, membranaceous. Lemmas thin, truncate and 2 to 4-toothed at the summit, bearing a slender awn from or below the middle, the awn straight, bent, or twisted. (Ancient Greek name for some weedy grass.) (Deschampsia Beauv.)

Plants annual; awns strongly geniculate.....1. *A. danthonioides.*
Plants perennial; awns straight.
  Panicle loose or open.
    Plants slender; panicle branches erect.....2. *A. elongata.*
    Plants robust; panicle branches spreading.....3. *A. caespitosa.*
  Panicle dense; plant stout.....4. *A. holciformis.*

1. **A. danthònioides** Trin. Culms slender, erect, 1.5 to 3.8 dm. high; blades few, short and narrow; panicle open, 8 to 15 cm. long, the branches capillary, stiffly ascending, naked below, bearing a few spikelets toward the ends; glumes 7 to 8 mm. long, acuminate, smooth except the keel, exceeding the florets; lemmas smooth, shining, somewhat indurate, 2 to 3 mm. long, the base of the florets and the rachilla pilose; awns 4 to 6 mm. long.—Open ground at lower altitudes throughout the state; n. to Alas., s. to Mex. A form with smaller spikelets was described as Deschampsia gracilis Vasey.

2. **A. elongàta** Hook. Culms slender, erect, 3 to 12 dm. high; blades flat, narrow, the basal cluster usually capillary; panicle narrow, 15 to 30 cm. long; glumes 4 to 6 mm. long; lemmas 2 mm. long, similar to those of no. 1, the awns shorter.—Open ground: Sierra foothills; common in the Coast Ranges; occasional in S. Cal.; e. to Ariz., n. to Alas.

3. **A. caespitòsa** L. TUFTED HAIR GRASS. Culms erect, 6 to 12 dm. high; sheaths smooth; blades flat or folded, scabrous above; panicle drooping, 10 to 20 cm. long, the slender scabrous branches spikelet-bearing toward the ends; spikelets 4 mm. long, the florets distant; lemmas smooth, erose-truncate; awn from near the base, but little longer than the lemma, straight, articulated at the base, deciduous.—Common in mt. meadows and bogs: Sierra Nevada; high mts. of S. Cal.; northern regions of the n. hemisphere, south in the mts. to Mex.

4. **A. holcifórmis** (Presl) Steud. Fig. 91. Culms tufted, 6 to 12 dm. high; blades tightly folded or involute, firm, mostly basal, smooth or somewhat scabrous especially toward the tip, the cauline blades short; ligule 4 to 6 mm. long; panicle narrow, mostly dark or bronze-color, 15 to 20 cm. long.—Marshes, bogs, and moist places near the coast, Monterey Co. to Del Norte Co.; n. to Ore.

91. Aira holciformis Steud.; *a*, panicle x ⅓; *b*, glumes x 5; *c*, florets x 5.

34. ÁSPRIS Adans.

Low delicate annuals. Spikelets 2-flowered. Glumes about equal, acute, membranaceous or sub-scarious. Lemmas firm, rounded on the back, tapering into two slender teeth, the callus with a very short tuft of hairs, bearing on the back below the middle a slender geniculate twisted usually exserted awn, this reduced or wanting in the lower floret in one species. (Ancient Greek name, meaning unknown.) (Aira of authors.)

Awns of both florets 3 to 4 mm. long.....1. *A. caryophyllea.*
Awn of lower floret minute or wanting.....2. *A. capillaris.*

92. Aspris caryophyllea Nash; *a*, spikelet x 8; *b*, florets x 8.

1. **A. cáryophýllea** (L.) Nash. Fig. 92. Culms in small tufts, erect, 1 to 3 dm. high; blades short, setaceous; panicle open, the silvery shining spikelets 3 mm. long, clustered toward the ends of the spreading capillary branches; lemmas alike.—Open dry ground, common throughout the state; nat. from Eur.

2. **A. capillàris** (Host.) Hitchc. Similar to no. 1, panicle more diffuse; spikelets scattered at the ends of the branches, 2.5 mm. long; lemma of lower floret awnless or with a minute awn just below the apex, the teeth short.—Waste ground, rare in Cal. (Sonoma Co., Humboldt Co.); nat. from Eur.

35. NOTHÓLCUS Nash

Perennials with flat blades and contracted panicles. Spikelets 2-flowered, the pedicel disarticulating below the glumes, the rachilla curved and somewhat elongate below the first floret, not prolonged above the second floret. Glumes about equal, longer than the two florets. First floret perfect, its lemma awnless; second floret staminate, its lemma awned on the back. (Greek nothos, false, and Holcus, the genus name formerly applied to this group.) (Holcus of authors.)

1. **N. lanàtus** (L.) Nash. VELVET GRASS. Fig. 93. Plant grayish, velvety-pubescent; culms erect, 3 to 6 dm. high; panicle 5 to 10 cm. long, narrow, sometimes almost spike-like, purple tinged; spikelets 4 to 5 mm. long; glumes villous, hirsute on the nerves, the second broader than the first, 3-nerved; lemmas ciliate at the apex; awn of the second floret hook-like.—Cult as a meadow grass in the U. S.; introd. from Eur. and escaped, especially in the Coast Ranges.

93. Notholcus lanatus Nash; *a*, glumes; *b*, florets. x 5.

N. MÓLLIS (L.) Hitchc., a European species with glabrous sheaths and producing rhizomes, has been found at Eureka.

36. DANTHÒNIA Lam. & DC. OAT GRASS

Tufted, low or rather tall perennials, with few-flowered panicles of rather large spikelets; late in the season producing large 1 to few-flowered cleistogenes in the bases of the lower sheaths, the nodes immediately below commonly breaking. Spikelets several-flowered. Glumes about equal, broad and papery, acute, mostly exceeding the uppermost floret. Lemmas rounded on the back, obscurely several-nerved, the base with a strong callus, the apex bifid, the lobes acute, usually extending into slender awns, a stout awn arising from between the lobes, this flat, tightly twisted below, geniculate, exserted. (Etienne Danthoine, French botanist.)

Sheaths pubescent.
- Spikelets 2 to 5 ..... 1. *D. americana.*
- Spikelets solitary ..... 2. *D. unispicata.*

Sheaths glabrous, or hairy at throat only.
- Spikelets on spreading pedicels ..... 3. *D. californica.*
- Spikelets on short erect pedicels, forming a narrow spike-like panicle. 4. *D. intermedia.*

1. **D. americàna** Scribn. Culms 3 to 6 dm. high, smooth, tending to disarticulate at the nodes; sheaths pilose; blades short, flat, or those of the innovations involute; panicle open, the pedicels usually about 1.5 cm. long, spreading or somewhat reflexed; glumes 1.5 to 2 cm. long, smooth, acuminate, about 7-nerved; lemmas 5 to 7 mm. long, smooth on the back, pilose at base and margins, broad, abruptly contracted into 2 teeth with awns 2 to 6 mm. long.—Wet meadows and moist places in rocks: San Bernardino Mts.; higher Sierra Nevada; along the coast; n. to B. C., e. to Wyo.; also in Chile.

2. **D. ùnispicàta** Munro. Culms short, 1.5 to 2 dm. high, about as long as the numerous basal leaves; sheaths and blades pilose; panicle reduced to a

single perfect spikelet on a flexuous pedicel, with 1 or 2 rudimentary spikelets below, the perfect spikelet similar to those of no. 1; lemma more gradually acuminate into awns.—Rocky hills, Lassen Co. to Modoc Co.; n. to Wash., e. to Wyo.

3. **D. californica** Boland. Fig. 94. Resembles no. 1; culms 6 to 9 dm. high; sheaths glabrous or somewhat pilose at the throat; blades scabrous above, longer, especially those of the less numerous innovations; teeth of lemma more gradually acuminate.—Dry hills, frequent in the Coast Ranges from San Luis Obispo Co. to Mendocino Co., rare in Sierra Nevada (Yosemite; Butte Co.); e. to Mont. and Col.

4. **D. intermèdia** Vasey. Culms 1.5 to 3.8 dm. high; blades becoming involute, more or less pilose; panicle compact, often 1-sided, 2.5 to 5 cm. long; glumes 1.2 to 1.5 cm. long; lemmas similar to those of no. 1, the teeth more gradually acuminate, the awns shorter.—Mt. meadows, high Sierra Nevada from Tulare Co. to Eldorado Co.; n. to B. C., e. to Quebec and N. Mex.

94. Danthonia californica Boland.; *a*, habit x ¼; *b*, spikelet x 2½; *c*. floret x 2½.

TRIBE 4. **Ágrostídeae.** TIMOTHY TRIBE

Spikelets 1-flowered, usually perfect, in open, contracted, or spike-like panicles.

37. CÁLAMAGRÓSTIS Adans. REED GRASS

Perennials, usually rather tall or robust, with small spikelets in open or narrow panicles. Rachilla disarticulating above the glumes, usually prolonged behind the palea as a short, commonly hairy bristle. Glumes about equal, acute or acuminate. Lemma shorter and usually more delicate than the glumes, the callus bearing a tuft of hairs, awned from the back, usually below the middle, the awn being delicate and straight, or stouter and exserted, bent and sometimes twisted. Palea shorter than the lemma. (Greek calamos, reed, and agrostis, grass.)

Awn longer than the glume, and geniculate.
- Panicle open, the branches spreading.
  - Blades mostly basal, capillary ..... 1. *C. breweri.*
  - Blades scattered, broad and flat ..... 2. *C. bolanderi.*
- Panicle compact, spike-like.
  - Glumes about 10 mm. long, gradually long-acuminate ..... 3. *C. foliosa.*
  - Glumes 6 to 8 mm. long, abruptly acute or acuminate ..... 4. *C. purpurascens.*

Awn shorter than the glumes, straight or somewhat geniculate.
- Panicle loose, the branches spreading or ascending.
  - Callus hairs copious, as long as lemma ..... 5. *C. canadensis.*
  - Callus hairs sparse, shorter than lemma.
    - Glumes 3 to 4 mm. long ..... 6. *C. californica.*
    - Glumes 5 to 6 mm. long ..... 7. *C. nutkaensis.*
- Panicle narrow, more or less spike-like.
  - Sheaths pubescent on collar ..... 8. *C. rubescens.*
  - Sheaths glabrous on collar.
    - Glumes ovate, firm or indurate, 4 mm. long; awn straight. 9. *C. crassiglumis.*
    - Glumes lanceolate, thin.
      - Glumes 5 to 6 mm. long; awn geniculate ..... 10. *C. densa.*
      - Glumes 3 mm. long; awn straight ..... 11. *C. inexpansa.*

1. **C. brèweri** Thurb. Culms slender, erect, cespitose, 1.5 to 3 dm. high; panicle few-flowered, purple, 2.5 to 8 cm. long; glumes 3 to 4 mm. long, 1-nerved, smooth, acute; lemma nearly as long as glumes, cuspidate-toothed, the awn borne near the base, twisted below, about 2 mm. long above the bend.—Mt. meadows of the high Sierra Nevada.

2. **C. bolánderi** Thurb. Fig. 95. Culms 9 to 12 dm. high; sheaths scabrous; blades flat, scattered, nearly smooth; panicle 10 to 20 cm. long, the branches verticillate, spreading, naked below; glumes 3 to 4 mm. long, purple, scabrous, acute; lemma very scabrous, about as long as glumes, the awn from near

95. Calamagrostis bolanderi Thurb.; *a*, portion of panicle x ½; *b*, glumes x 7; *c*, floret x 7.

base, about 3 mm. long above the bend.—Bogs and moist ground, prairie or open woods near the coast, Mendocino and Humboldt Cos.

3. **C. foliòsa** Kearn. Culms tufted, erect, 3 to 6 dm. high; leaves mostly basal, numerous, the blades involute, firm, smooth, nearly as long as culm; panicle 5 to 8 cm. long; lemma 5 to 7 mm. long, acuminate, 4-nerved, the nerves ending in setaceous teeth; awn from near base, about 8 mm. long above the bend; callus hairs numerous, 3 mm. long.—Near the coast, Mendocino and Humboldt Cos.

4. **C. purpuráscens** R. Br. PURPLE REED GRASS. Culms tufted, erect, 4.5 to 6 dm. high; sheaths scabrous; blades flat or more or less involute, scabrous; panicle 5 to 13 cm. long, pale or sometimes purple; lemma nearly as long as glumes, 4-nerved, apex with 4 setaceous teeth, the awn from near base, finally geniculate, exserted about 2 mm.—In mt. meadows and on rocks: high Sierra Nevada in Mariposa Co.; Mt. Tamalpais; n. to the arctic, e. to Col.

5. **C. canadénsis** (Michx.) Beauv. BLUEJOINT. Culms 6 to 12 dm. high, from creeping rhizomes; blades scattered, flat, rather lax, scabrous, 4 to 8 mm. wide; panicle rather narrow but loose and open, especially at base; glumes 4 mm. long, smooth, scabrous on keel, acuminate; lemma nearly as long as glumes, smooth, narrowed toward summit; awn delicate, inconspicuous, straight, attached just below the middle of the lemma and extending to or slightly beyond its tip; rachilla joint delicate, sparsely long-pilose.—Mt. meadows and open woods, high Sierra Nevada from Tulare Co. to Eldorado Co.; n. to Alas., e. to the Atlantic. Exceedingly variable.

6. **C. califórnica** Kearn. Culms 9 dm. high; blades flat, firm, rather rigid, 4 mm. wide, those of the innovations involute; panicle 15 to 20 cm. long, narrow, loose; glumes scabrous, acuminate; lemma shorter than the glumes, strongly nerved; awn delicate, straight, attached below the middle, extending to tip of lemma.—Known only from a coll. by Lemmon in the Sierra Nevada, probably in Sierra Co. Resembling no. 5 but having more rigid firm blades.

7. **C. nutkaénsis** (Presl) Steud. Culms stout, 9 to 15 dm. high; blades flat, becoming inrolled, elongate, gradually narrowed into a long involute point; panicle narrow, rather loose, 15 to 30 cm. long, the branches rather stiffly ascending; glumes acuminate; lemma 4 mm. long, indistinctly nerved, the callus hairs ½ as long; awn rather stout, attached below the middle, slightly geniculate, extending to summit of lemma.—Bogs and swamps near the coast, Monterey Co. to Del Norte Co.; n. to Alas. (C. aleutica Bong.)

8. **C. rubéscens** Buckl. PINE GRASS. Culms slender, 6 to 9 dm. high; from creeping rhizomes; sheaths smooth, but pubescent on the collar; blades flat or somewhat involute; panicle spike-like, pale or purple, 7 to 15 cm. long; glumes 4 to 5 mm. long, narrow, acuminate; lemma pale, thin, about as long as glumes, smooth, scarcely nerved, the callus hairs about ⅓ as long; awn attached near base, geniculate, exserted at side of glumes, the terminal part about 1 mm. long.—Open pine woods, banks and prairies, Santa Clara and Santa Cruz Cos. to Mendocino Co.; n. to B. C., e. to Manit. and Col.

9. **C. crassiglùmis** Thurb. Culms rather stout, 1.5 to 4.5 dm. high; blades flat, or somewhat involute, smooth, firm, about 4 mm. wide; panicle spike-like, 2.5 to 5 cm. long; glumes 4 mm. long, rather abruptly acuminate, purple, scaberulous; lemma about as long as glumes, broad, obtuse; callus hairs abundant, about half as long as lemma; awn attached at middle of back, about as long as lemma; rachilla joint 1 mm. long, the hairs reaching to apex of lemma.—Swampy ground, Mendocino Co. (only known loc. in Cal.); n. to Vancouver Isl.

10. **C. dénsa** Vasey. Culms 4.5 to 9 dm. high, with creeping rhizomes; ligule 3 to 5 mm. long; blades flat or becoming somewhat involute, firm, scabrous, 2 to 4 mm. wide; panicle spike-like, more or less interrupted at base, 5 to 10 cm. long, pale or purple; glumes acuminate; lemma 3 to 4 mm. long, scaberulous; awn attached near base, shorter than the glumes, the upper part 2 mm. long, exserted at side of glumes; callus hairs scant, very short; rachilla joint, including hairy tip, half as long as floret.—Dry hills and banks, Coast Ranges, s. to San Diego Co.; n. to Siskiyou Co. and Ore. The taller coarser plants are typical C. densa found in Cal. only. C. koelérioìdes Vasey, a form with slender culms, ligule 2 to 3 mm. long, and callus hairs ¼ to ⅓ as long as lemma, extends from Ore. to San Diego.

11. **C. inexpánsa** Gray. Culms 3 to 6 dm. high, producing stout rhizomes; sheaths smooth, the outer basal ones numerous, marcescent, persistent; blades loosely involute, scabrous, 2 to 4 mm. wide; panicle 5 to 8 cm. long; glumes scaberulous; lemma about as long as glumes, scabrous, the callus hairs ½ to ¾ as long; awn attached about the middle, about as long as glumes; rachilla joint minute, some of the hairs reaching to tip of lemma.—Meadows and marshes, Sierra Nevada, 5000 to 9000 ft., from Tulare Co. to Lassen Co.; extends from n. U. S. to arctic Am.; also Eurasia. Widespread and variable. C. hyperborea Lange, a European species, has a denser panicle.

38. **AMMÓPHILA** Host

A tough rather coarse erect perennial, with hard scaly creeping rhizomes, long tough involute blades, and a pale dense spike-like panicle. Spikelets 1-flowered, compressed, the rachilla disarticulating above the glumes, produced beyond the palea as a short bristle, hairy above; glumes about equal, chartaceous; lemma similar to and slightly shorter than the glumes, the callus bearing a tuft of short hairs; palea nearly as long as the lemma. (Greek ammos, sand, and philein, to love.)

1. **A. arenària** (L.) Link. Beach Grass. Fig. 96. Culms stout, 6 to 9 dm. high; blades elongate, gradually narrowed into an involute point; panicle 10 to 30 cm. long; spikelets 1 to 2 cm. long.—Introd. on the Pacific Coast where it has been used as a sandbinder on seacoast sand-dunes; native of Eur.

96. Ammophila arenaria Link; habit x ⅓.

39. **AGRÓSTIS** L. Bent Grass

Annuals or usually perennials, delicate or rather tall, with glabrous culms, scabrous blades, and open or contracted panicles of small spikelets. Rachilla disarticulating above the glumes, usually not prolonged. Glumes equal or nearly so, acute, acuminate, or sometimes awn-pointed, carinate; lemma obtuse, usually shorter and thinner in texture than the glumes, awnless or dorsally awned, often hairy on the callus. Palea usually shorter than the lemma, 2-nerved in only a few species, usually small and nerveless or obsolete. (Ancient Greek name of a forage grass, from agros, a field.)

Rachilla prolonged behind the palea.....1. *A. thurberiana.*
Rachilla not prolonged.
  Palea evident, 2-nerved.
    Panicle contracted, lobed or verticillate; glumes scabrous.....2. *A. verticillata.*
    Panicle open or contracted, buf not lobed; glumes scabrous on keel, otherwise smooth.
      Plants with rhizomes, the culms not creeping.....3. *A. palustris.*
      Plants extensively creeping.....4. *A. maritima.*
  Palea wanting or a small nerveless scale.
    Lemma with a delicate awn 5 mm. long; annual.....5. *A. exigua.*
    Lemma awnless or short-awned; perennials.
      Plants spreading by rhizomes (see A. lepida with short rhizomes).
        Callus hairs 1 to 2 mm. long.....6. *A. hallii.*
        Callus hairs minute or wanting.
          Panicle contracted.....7. *A. pallens.*
          Panicle open.....8. *A. diegoensis.*

Plants tufted, not producing rhizomes or only very short ones.
Panicle narrow, usually a part of the lower branches spikelet-bearing from base.
Panicle strict, branches short, appressed; plant low, tufted..... 9. *A. breviculmis.*
Panicle narrow but not strict, or somewhat open.
Panicle short to elongate; glumes scabrous on the back; plants of low and middle altitudes.....10. *A. exarata.*
Panicle 2 to 4 cm. long; glumes not scabrous on the back; low plant of high altitudes.....11. *A. rossae.*
Panicle open, sometimes diffuse; branches naked at base.
Lemma awned; panicle purple; ligule 5 to 8 mm. long..... 16. *A. longiligula.*
Lemma awnless; ligule usually short.
Panicle very diffuse; spikelets clustered toward end of branchlets.....12. *A. hiemalis.*
Panicle open, but not conspicuously diffuse.
Plants producing short rhizomes.....15. *A. lepida.*
Plants not producing rhizomes.
Plants delicate, 1 to 3 dm. tall....13. *A. idahoensis.*
Plants taller, over 4.5 dm. tall...14. *A. oregonensis.*

1. **A. thúrberiàna** Hitchc. Culms slender, erect, 2 to 3.8 dm. high; panicle narrow, lax, more or less drooping, 5 to 8 cm. long; spikelets green or pale, rarely purple, 2 mm. long; lemma nearly as long as glumes, the palea about ⅔ as long; prolonged rachilla minute.—Bogs and moist places, high Sierra Nevada from Tulare Co. to Lassen Co. and n. to Siskiyou Co.; far n. to B. C., e. to Mont.

2. **A. vérticillàta** Vill. Culms usually decumbent at base, sometimes with long creeping and rooting stolons; panicle verticillate, especially at base, 4 to 10 cm. long, light green or rarely purplish, the branches spikelet-bearing from the base; glumes equal, obtuse, 2 mm. long; lemma ½ as long, awnless, truncate, toothed at apex; palea nearly as long as the lemma.—Moist ground, especially along irrigation ditches and near the coast, Mendocino, Mariposa and Inyo Cos., s. to S. Cal.; nat. from Eur. Resembles in habit Polypogon lutosus which differs in having awned glumes. (A. stolonifera of authors.)

97. Agrostis palustris Huds.; *a*, habit x ⅓; *b*, spikelet x 8; *c*, floret lifted above glumes x 8.

3. **A. palústris** Huds. REDTOP. Fig. 97. Culms erect or decumbent and rooting at base, 3 to 9 dm. high, sending out from the base rhizomes or stolon-like stems; panicle pyramidal, loose but not diffuse, 5 to 30 cm. long, the lower branches in whorls; glumes acute, 2 to 3 mm. long, scabrous on keel; lemma a little shorter than the glumes, obtuse, rarely awned on back; palea ½ to ⅝ as long as lemma.—Cult. as a meadow grass, frequently escaped along roadsides and in waste places; introd. from Eur. (A. alba of authors.)

4. **A. marítima** Lam. Differs from no. 3 in having decumbent rooting base and often widely spreading short-bladed stolons, and narrow contracted panicles.—Along the coast from Sonoma Co. to Del Norte Co.; n. coasts of N. Am. and Eur. On moist sand-dunes the stolons are conspicuous. (A. alba var. maritima Meyer.)

5. **A. exígua** Thurb. Culms delicate, 3 to 12 dm. high; panicle ½ the length of plant, finally open; glumes 1.5 mm. long, scaberulous; lemma equaling the glumes, bearing below the tip a slender awn 4 times as long.—Wet open ground, Howell Mt. and Sierra foothills; very rare.

6. **A. hállii** Vasey. Culms erect, stout, 6 to 9 dm. high; ligule usually conspicuous; panicle 10 to 15 cm. long, narrow, open; glumes about 2 lines long; lemma awnless, 3 mm. long, the callus hairs about ½ as long.—Mostly in woods near the coast, Santa Barbara Co. to Del Norte Co.; n. to Ore. Var. PRÍNGLEI Hitchc. Differs in the narrower and more compact panicles, narrower and more involute blades and more stramineous foliage.—Near the coast, Mendocino Co.

7. **A. pállens** Trin. Culms 2 to 3.8 dm. high, erect; panicle almost spikelike, 5 to 10 cm. long; glumes 2.5 to 3 mm. long; lemma a little shorter than

the glumes, awnless.—Sandy soil near the coast from Marin Co. to Del Norte Co.; n. to Wash.

8. **A. diègoénsis** Vasey. Differs from no. 7 in the taller culms, and more open panicles, the branches rather stiffly ascending; lemma awnless (in most of the Cal. specimens) or with a straight or rarely a bent awn.—Meadows and open woods: San Jacinto Mts.; Sierra Nevada from Mariposa Co. north; along the coast from San Diego to Humboldt Co.; n. to B. C.

9. **A. brevicúlmis** Hitchc. Culms erect, 1 to 1.5 dm. high; panicle about 2.5 cm. long; glumes 3 mm. long, acute; lemma a little more than ½ as long as glumes, awnless or bearing a very short awn near the middle of the back; palea a minute nerveless scale.—Open ground and on cliffs, Ft. Bragg, Mendocino Co.; also in Peru.

10. **A. exaràta** Trin. Culms erect, 3 to 12 dm. high, or often depauperate; panicle contracted and spike-like or loose and somewhat spreading, the branches densely flowered; glumes 2.5 to 3.5 mm. long; lemma 2 mm. long, awnless, or rarely with a short prickle on the back; palea a minute nerveless scale.—Moist to rather dry open ground, throughout the state from the seacoast to middle altitudes in the mts.; extends from Alas. to Mex. and the Rocky Mts. Exceedingly variable. The form originally described as A. exarata is about the center of the range of variation, being 3 to 6 dm. high, with lemmas awnless or with a rudimentary awn. A. glomerata (Presl) Kunth is a low seacoast form with a compact panicle and often inflated sheaths; A. microphylla Steud. has well-developed awns; A. grandis Trin. and A. ampla Hitchc. are robust forms with blades up to 8 mm. wide; the first with compact panicles and awnless lemmas, the second with looser panicles and awned lemmas.

11. **A. róssae** Vasey. Culms 1 to 2 dm. high; panicles contracted, the branches appressed; spikelets green or purple, 2 mm. long; lemma 1.5 mm. long, awnless; palea minute.—Rocky creeks and mt. slopes, Sierra Nevada from Kern Co. to Nevada Co., 7000 to 9000 ft.; n. to Wash., e. to Wyo. Differs from no. 10 chiefly in size, possibly an alpine form of that species.

12. **A. hiemàlis** (Walt.) B. S. P. TICKLE GRASS. Culms slender, in tufts with numerous short setaceous basal leaves, 2 to 9 dm. high; but usually delicate; panicle few-flowered, 15 to 30 cm. long, about as wide, the branches scabrous, long and capillary, stiff, not flexuous; glumes 1.5 to 2 mm. long, acute or acuminate; lemma ⅔ to ¾ as long as glumes, awnless or rarely awned; palea wanting.—Meadows and moist places: Sierra Nevada; high mts. of S. Cal.; throughout N. Am. Var. GEMINÀTA Hitchc. Differs in having a smaller, less diffuse panicle; culms usually less than 1 ft. high; lemma awnless in Cal. specimens.—Kern River; Lassen Peak; n. to Alas.

13. **A. ìdahoénsis** Nash. Culms slender; panicle loosely spreading, 5 to 10 cm. long, the branches capillary, flexuous; spikelets 1.5 mm. long; lemma 2 mm. long, awnless; palea minute.—Mt. meadows, 4000 to 6500 ft.: San Bernardino Mts.; Sierra Nevada from Tulare Co. to Sierra Co.; n. to Wash., e. to Col.

14. **A. óregonénsis** Vasey. Culms 6 to 9 dm. high; panicle oblong, 10 to 30 cm. long, the branches verticillate, rather stiff and ascending, the lower whorls numerous, the longer 7 to 15 cm. long, branching above the middle; glumes 2.5 to 3 mm. long; lemma 1.5 mm. long, awnless; palea minute.—Wet meadows, 5000 to 7000 ft.: San Jacinto Mts.; San Bernardino Mts.; Sierra Nevada from Mariposa Co. to Plumas Co.; n. to B. C., s. to Mex. (A. schiedeana of authors.)

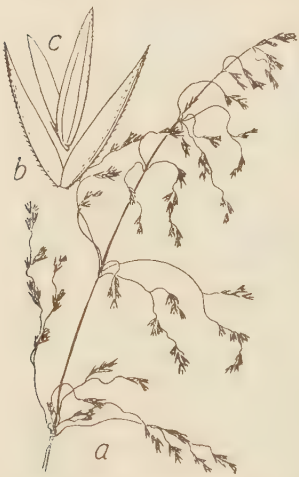
15. **A. lépida** Hitchc. Culms tufted, 3 to 4.5 dm. high, erect, producing numerous short rhizomes; ligule long, especially on the innovations, these as much as 4 mm. long, narrow, pointed; blades mostly basal, firm, erect, flat or folded, the upper culm leaf below the middle of the culm; panicle 10 to 15 cm. long, the branches in verticils, stiff and straight, becoming divaricately spreading, the lowermost 2.5 to 5 cm. long, spikelet-bearing from about the middle, some short branches intermixed; glumes 3 mm. long; lemma 2 mm. long.—Meadows and open woods, 8000 to 10,500 ft., upper Kern River.

16. **A. longilígula** Hitchc. Culms erect, about 6 dm. high; ligule 5 to 6 mm. long; panicle narrow, but loosely flowered, bronze-purple, 10 to 15 cm. long, the branches very scabrous; glumes 4 mm. long; lemma 2.5 mm. long, bearing at the middle a bent exserted awn; palea minute.—Bogs and moist places near the coast, Mendocino Co.; n. to Alas.

A. RETROFRÁCTA Willd., an Australian species, with very open panicle nearly half the entire height of the plant, and florets with the rachilla prolonged behind the palea, is adventive near Stockton.

40. CÍNNA L.

Tall perennials with flat blades and large panicles. Spikelets disarticulating below the glumes, the rachilla forming a stipe below the floret and produced behind the palea as a minute bristle. Glumes equal, 1-nerved. Lemma nearly as long, 3-nerved, bearing a minute short straight awn just below the apex. (Ancient Greek name for some kind of grass.)



98. Cinna latifolia Griseb.; *a*, panicle x ⅓; *b*, glumes x 5; *c*, floret x 5.

1. **C. latifòlia** (Trevir.) Griseb. Fig. 98. Culms 6 to 12 dm. high; blades 1 to 1.5 cm. wide; panicle 15 to 30 cm. long, the flexuous capillary branches spreading or drooping; glumes scabrous, 4 mm. long; nerves of the palea so close together as to appear like a single one.—Moist places in woods and along streams, Sierra Nevada from Tulare Co. to Eldorado Co., 6500 to 9500 ft.; cooler regions of N. Am. and Eurasia.

41. ALÒPECÙRUS L. Meadow Foxtail

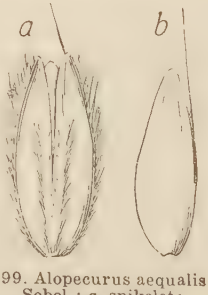
Low perennials with flat blades and soft dense spike-like panicles. Spikelets disarticulating below the glumes, strongly compressed laterally. Glumes equal, usually united at base, ciliate on the keel. Lemma about as long as the glumes, 5-nerved, obtuse, the margins united at base, bearing from below the middle a slender dorsal awn, this included or exserted two or three times the length of the spikelet; palea wanting. (Greek alopex, fox, and oura, tail.)

Spikelets 3 to 4 mm. long; panicle oblong, 6 to 7 mm. wide..... ..1. *A. saccatus.*
Spikelets 2 mm. long; panicle narrow, linear, 3 to 4 mm. wide.....2. *A. aequalis.*

1. **A. saccàtus** Vasey. Culms 1.5 to 6 dm. high; sheaths inflated; panicles oblong, 2.5 to 5 cm. long; glumes 3 to 4 mm. long; lemma sparsely pilose on the sides, the awn exserted about 3 mm.—Meadows and wet places: Coast Ranges s. to San Diego Co.; Merced Co.; n. to Wash. and Ida. Taller specimens with spikelets 3 mm. long are the form described as A. californicus Vasey.

2. **A. aequàlis** Sobol. Fig. 99. Culms erect or spreading, 1.5 to 6 dm. high; panicles narrow-cylindric, 2.5 to 7 cm. long; glumes 2 mm. long; awn scarcely exserted. —In water and wet places throughout the state at middle and high altitudes; throughout colder part of N. Am. Occasional specimens with longer awns occur, approaching A. geniculatus L. (A. aristulatus Michx.)

A. PRATÉNSIS L., the cult. Meadow Foxtail, resembling no. 1, but with spikelets about 6 mm. long, is sparingly nat. from Eur.



99. Alopecurus aequalis Sobol.; *a*, spikelet; *b*, floret. x 10.

42. POLYPÒGON Desf.

Annuals or perennials, usually decumbent, with flat blades and dense bristly spike-like panicles. Pedicel disarticulating a short distance below the glumes, leav-

ing a short-pointed callus; glumes equal, entire or 2-lobed, awned from the tip or from between the lobes, the awn slender, straight; lemma much shorter than the glumes, hyaline, usually bearing a slender straight awn shorter than the awns of the glumes. (Greek polus, much, and pogon, beard.)

Sheaths scabrous; awn about as long as the glumes; panicles more or less interrupted or lobed ..... 1. *P. lutosus.*
Sheaths smooth.
Awn slightly exceeding body of glumes; panicle spike-like ..... 2. *P. monspeliensis.*
Awn twice as long as glumes; panicle scarcely lobed ..... 3. *P. maritimus.*

1. **P. lutòsus** (Poir.) Hitchc. Culms geniculate at base, 3 to 7.5 dm. high; sheaths scabrous; ligule 2 to 4 mm. long or the uppermost longer; panicles oblong, 5 to 15 cm. long, more or less interrupted or lobed; glumes scabrous, 2 to 3 mm. long, bearing an awn as long; lemma smooth and shining, 1 mm. long, minutely toothed at the truncate apex; awn about as long as the glumes.—Waste ground, throughout the state, especially along irrigation ditches; nat. from Eur. (P. littoralis Sm.)

2. **P. monspèliénsis** (L.) Desf. BEARD GRASS. Fig. 100. Culms erect or decumbent at base, scabrous below panicle, depauperate or as much as 9 dm. long; sheaths smooth, the ligule large; panicles soft, dense, spike-like, 2.5 to 15 cm. long, tawny-yellow; glumes hispidulous; floret turgid, the awn slightly exceeding the body of the glumes.—Waste places, common along irrigation ditches; nat. from Eur.

100. Polypogon monspeliensis Desf.; *a*, spikelet; *b*, floret. x 10.

3. **P. marítimus** Willd. Culms 2 to 3 dm. high, upright or spreading; sheaths smooth; ligule as much as 6 mm. long; blades usually less than 5 cm. long, 2 to 4 mm. wide; panicle cylindric, scarcely lobed, 5 cm. long or less, 1 cm. thick; glumes lanceolate, about 3 mm. long, villous, the awn as much as 7 mm. long.—Waste ground, cent. Cal.; nat. from Eur.

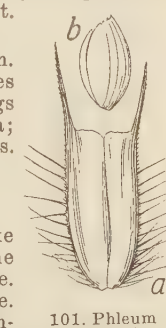
43. PHLÈUM L.

Annuals or perennials, with erect culms, flat blades, and dense spike-like panicles. Spikelets laterally compressed, disarticulating above the glumes. Glumes equal, membranaceous, keeled, abruptly mucronate or awned. Lemma shorter than the glumes, hyaline, broadly truncate, 3 to 5-nerved. Palea narrow, nearly as long as the lemma. (Greek phleos, a kind of reed.)

Heads cylindric, several times longer than wide ..... 1. *P. pratense.*
Heads ovoid or oblong, 1½ to 2 times as long as broad ..... 2. *P. alpinum.*

1. **P. praténse** L. TIMOTHY. Fig. 101. Culms 6 to 12 dm. high, from a swollen or bulb-like base; panicles 3 to 15 cm. long.—Commonly escaped from cult., along roadsides and in fields and waste places; nat. of Eur.

2. **P. alpìnum** L. MOUNTAIN TIMOTHY. Culms 2 to 4.5 dm. high, from a decumbent somewhat creeping base; panicles ellipsoid or short-cylindric.—Common in mt. meadows, bogs and wet places: San Jacinto Mts.; high Sierra Nevada; Mendocino Co.; cooler parts of N. Am. and Eurasia; in mts. extending to S. Am.



101. Phleum pratense L.; *a*, spikelet; *b*, floret. x 8.

44. GASTRÍDIUM Beauv.

Annuals with flat blades and pale shining spike-like panicles. Spikelets disarticulating above the glumes, the rachilla prolonged behind the palea as a minute bristle. Glumes unequal, somewhat enlarged or swollen at the base. Lemma much shorter than the glumes, hyaline, broad, truncate, awned. Palea about as long as the lemma. (Greek gaster, belly, referring to the saccate glumes.)

102. Gastridium ventricosum Schinz & Thell.; *a*, spikelet; *b*, floret. x 6.

1. **G. ventricòsum** (Gouan) Schinz & Thell. NIT GRASS. Fig. 102. Culms about 3 dm. high, smooth; panicle 5 to 8 cm. long, dense; glumes 3 to 6 mm. long, gradually acuminate; lemma globular, about 1 mm. long, pubescent at apex, the awn 5 mm. long, geniculate.—Open ground and waste places at middle altitudes, mostly in the Coast Ranges, s. to S. Cal.; nat. from Eur. (G. lendigerum Gaud.)

45. LAGÙRUS L.

Low annual with pale dense ovoid or oblong woolly heads. Spikelets disarticulating above the glumes, the rachilla produced beyond the palea. Glumes thin, 1-nerved, villous, tapering into a plumose point. Lemma shorter than the glumes, thin, glabrous, bearing a slender exserted somewhat geniculate dorsal awn, the summit bifid, the divisions delicately awn-tipped. Palea narrow, thin, the keels ending in minute awns. (Greek lagos, hare, and oura, tail.)

1. **L. ovatus** L. HARE'S-TAIL GRASS. Fig. 103. Plants softly pubescent throughout, 1 to 3 dm. high; blades cordate at base; panicle about 2.5 cm. long, nearly as thick; glumes very narrow, 10 mm. long.—Cult. for ornament and sparingly escaped, along the coast only (San Francisco, Berkeley and Monterey), mostly on points that extend into the ocean; native of Eur.

103. Lagurus ovatus L.; *a*, panicle x ½; *b*, glumes x 3; *c*, floret x 3.

46. EPICÁMPES Presl

Tall cespitose perennials, ours with narrow spike-like panicles. Spikelets disarticulating above the glumes. Glumes about equal. Lemma 3-nerved, awnless in our species. (Greek epicampes, curved.)

104. Epicampes rigens Benth.; *a*, habit x ⅛; *b*, spikelet x 10.

1. **E. rigens** Benth. DEER GRASS. Fig. 104. Culms erect, 9 to 12 dm. high; sheaths smooth or slightly scabrous, covering the nodes; ligule truncate, 1 to 2 mm. long; blades scabrous, elongate, involute, tapering into a long slender point; panicle spike-like, slender, 30 cm. or more long; glumes 2 to 3 mm. long, oblong, obtuse or somewhat erose, scarcely keeled; lemma slightly exceeding the glumes, scaberulous, sparsely pilose at base.—Dry or open ground, hillsides, gullies and open forest, Sierra Nevada foothills, s. to Santa Barbara and San Diego; e. to N. Mex., s. to Mex.

47. MUHLENBÉRGIA Schreb.

Mostly perennials, tufted or rhizomatous, the culms usually wiry, the inflorescence a narrow or open panicle. Spikelets disarticulating above the glumes. Glumes usually shorter than the lemma, obtuse to acuminate or awned, the first sometimes small, rarely obsolete. Lemma firm-membranaceous, 3 to 5-nerved, with a very short, usually minutely pilose callus, the apex extending into a straight or flexuous awn, or sometimes only mucronate. (Rev. Dr. Henry Muhlenberg, distinguished American botanist.)

Plants annual; lemmas long-awned.....1. *M. microsperma.*
Plants perennial (if delicate and seemingly annual, lemmas mucronate only).
Lemmas mucronate or cuspidate only, much longer than the glumes, glabrous or nearly so; blades less than 2 mm. wide.

Culms extensively creeping; blades conspicuously recurved-spreading; ligule about 1 mm. long.....2. *M. repens.*
Culms not creeping; ligule 2 to 3 mm. long.
Plants with scaly rhizomes; culm minutely nodulose-roughened.....3. *M. squarrosa.*
Plants tufted, without rhizomes, commonly decumbent at base; culm smooth.
Glumes ovate, entire; culms slender, often filiform.....4. *M. filiformis.*
Glumes truncate, toothed; culms wiry.....11. *M. jonesii.*
Lemmas awned, or if awnless, shorter than the awned glumes.
Plants with scaly rhizomes.
Callus hairs copious, about as long as the floret; panicle silvery grayish or purplish.....5. *M. andina.*
Callus hairs scant, inconspicuous; panicle not silvery.
Panicle subcylindric, bristly, spike-like; glumes awned, much exceeding the awnless lemma.....8. *M. racemosa.*
Panicle not spike-like; glumes not exceeding the awned lemma.
Blades minutely scaberulous, 2 to 3 mm. wide; panicle not compactly flowered.....6. *M. lemmoni.*
Blades very scabrous on both surfaces, 3 to 6 mm. wide; panicle rather compactly flowered.....7. *M. californica.*
Plants without rhizomes; bunch grasses.
Culms branching; panicle diffuse.....9. *M. porteri.*
Culms simple; panicle narrow.
Awn of lemma flexuous, 2 to 5 times as long as the body.....10. *M. montana.*
Awn of lemma straight, not longer than the body.....11. *M. jonesii.*

1. **M. microspérma** (DC.) Kunth. Plants branching, commonly purple; culms spreading, 1.5 to 3.8 dm. long; blades 2 to 5 cm. long, about 1 mm. wide; panicles narrow, loose, 2 to 8 cm. long; spikelets about 3 mm. long; glumes less than half as long as the spikelet, obtuse; awn of lemmas 3 to 5 times as long as the body.—Open ground, Monterey Co.; Kern Cañon; s. to the Mohave Desert; San Bernardino; e. to Ariz., s. to Mex. Cleistogamous spikelets are developed at the base of the lower sheaths. These are solitary or few in a fascicle in each axil, each spikelet included in the indurate thickened, tightly inrolled prophyllum, the glumes wanting and awn of lemma reduced, but the grain larger than that of spikelets in the terminal inflorescence. The prophyllum enclosing the spikelet is narrowly conical and readily disarticulates from the plant at maturity.

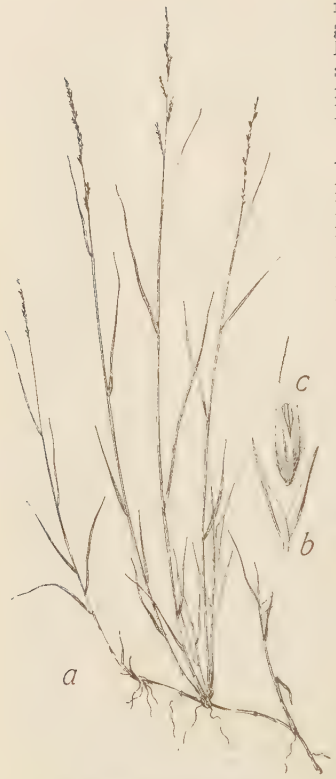
2. **M. rèpens** (Presl) Hitchc. Aparejo Grass. Plants with scaly rhizomes; culms slender, wiry, 1.5 to 3.8 dm. long; flowering branches ascending; blades involute, 1 to 3 cm. long; panicles narrow, interrupted, few-flowered, 1 to 2.5 cm. long; glumes ovate, acute, 1.5 mm. long, smooth; lemma exceeding the glumes, about 2 mm. long, smooth or sparsely pubescent, acute or mucronate, the lateral nerves often obsolete.—Death Valley region; e. to Ariz., thence s. to Mex.

3. **M. squarròsa** (Trin.) Rydb. Culms wiry, erect or decumbent at base, 1 to 5 dm. long; blades 1 to 5 cm. long; panicles narrow, interrupted, sometimes spike-like, 2.5 to 15 cm. long; glumes ovate, 1 mm. long; lemma lanceolate, acute, mucronate, 2 mm. long.—Dry or moist open ground: San Jacinto Mts.; Donner Lake; n. to Wash. and Mont., s. to Mex.

4. **M. filifórmis** (Thurb.) Rydb. Plants often erect, or decumbent at base, rather soft and lax; culms 10 to 25 cm. high; blades flat, usually less than 2.5 cm. long; panicles narrow, interrupted, few-flowered, 2.5 cm. long or less; glumes 2 mm. long; lemma lanceolate, acute, mucronate, 2 mm. long.—Mt. meadows and open woods: San Jacinto Mts.; San Bernardino Mts.; Sierra Nevada and n. to Siskiyou Co.; n. to Wash., e. to Col. Depauperate plants blooming the first year are found on wet sand.

5. **M. andina** (Nutt.) Hitchc. Culms erect or sometimes spreading, pubescent about the nodes, 4.5 to 9 dm. high; sheaths keeled; ligule 1 mm. long, short-ciliate; blades flat, 2 to 6 mm. wide, scabrous; panicles narrow, spike-like, usually more or less lobed or interrupted, often purple-tinged, 8 to 15 cm. long; glumes narrow, acuminate, 3 to 4 mm. long; lemma 3 mm. long, gradually narrowed into a capillary awn, 4 to 8 mm. long.—Open ground, montane, mostly 5000 to 9000 ft.: San Bernardino Mts.; Sierra Nevada; Mt. Shasta; n. to Wash., e. to Wyo. (M. comata Thurb.)

6. **M. lémmoni** Scribn. Fig. 105. Culms slender, wiry, erect or ascending, 3 to 6 dm. high; blades flat or somewhat involute; panicles narrow, inter-



105. Muhlenbergia lemmoni Scribn.; *a*, habit x ⅛; *b*, glumes x 5; *c*, floret x 5.

rupted, the branches short; glumes narrow, gradually acuminate, awn-tipped, about 3 mm. long; lemmas 3 mm. long, acuminate into an awn as much as 6 mm. long, the callus hairs rather sparse, about ½ as long as body of lemma.—Deserts, San Diego Co., e. to Tex.

7. **M. califórnica** Vasey. Culms erect, somewhat woody below, smooth, puberulent about nodes, 3 to 6 dm. high; sheaths scaberulous, keeled; ligule scarcely 1 mm. long; blades flat, usually short; panicles narrow, spike-like or interrupted, 8 to 15 cm. long; glumes narrow, acuminate or awn-tipped, 3 to 4 mm. long; lemma about 3 mm. long, scabrous, the callus hairs rather sparse, about ½ as long as lemma; awn 2 mm. long or less.—Borders of streams and irrigation ditches, cismontane S. Cal.

8. **M. racemòsa** (Michx.) B. S. P. Culms erect, simple or sparingly branched, 3 to 9 dm. high; blades 0.5 to 1 dm. long, scabrous; panicles 5 to 10 cm. long, dense, interrupted or lobed; spikelets 4 to 6 mm. long; glumes equal, the tips somewhat spreading.—Moist meadows and low ground, South Fork Eel River, Humboldt Co.; n. to Wash., e. to the Atlantic.

9. **M. pòrteri** Scribn. MESQUITE GRASS. Culms woody or persistent at base, numerous, wiry, widely spreading or clambering through bushes, scaberulous, more or less branched from all the nodes, 3 to 9 dm. long or more; sheaths smooth, spreading away from the branches, the prophyllum conspicuous; blades flat, 2.5 to 5 cm. long, early deciduous from the sheath; panicles 5 to 10 cm. long, the slender branches and branchlets brittle, widely spreading, bearing rather few long-pediceled spikelets; glumes narrow, acuminate, slightly unequal, the second longer, about 2 mm. long; lemma purple, acuminate, minutely pilose, 3 to 4 mm. long, the awn about 6 mm. long.—Rocky places, Colorado Desert; e. to Tex., s. to Mex.

10. **M. montàna** (Nutt.) Hitchc. Culms densely tufted, with numerous short leafy shoots at base, 18 to 50 cm. high; ligule 4 to 6 mm. long; blades involute, scabrous, sharp-pointed; panicles loose, 5 to 10 cm. long; glumes broad, oblong, sparsely pubescent, 2 mm. long, more or less erose at apex, the second 3-toothed; lemma 3 mm. long, sparsely pubescent at base and margins.—Dry ground, Sierra Nevada from Eldorado Co. to Mariposa Co., 4000 to 7000 ft.; e. to Wyo., s. to Mex. (M. gracilis of authors.)

11. **M. jònesii** (Vasey) Hitchc. Culms tufted, erect, slender, about 3 dm. high; blades mostly basal, involute, flexuous, scabrous; panicles narrow, loose, 5 to 8 cm. long; glumes equal, obtuse, toothed at apex, 1 to 1.2 mm. long; lemma 2 mm. long, acuminate, awn-pointed.—Placer Co. to Siskiyou and Modoc Cos., 4000 to 6000 ft.

48. SPORÓBOLUS R. Br. DROPSEED

Annuals or perennials with small spikelets in open or contracted panicles. Spikelets disarticulating above the glumes. Glumes usually unequal, the second often as long as the spikelet. Lemma membranaceous, 1-nerved, awnless. Palea usually prominent and as long as the lemma or longer; seed free from the pericarp. (Greek spora, seed, and bolos, throwing.)

Plants annual; glumes sparsely spreading-pilose.....1. *S. confusus.*
Plants perennial; glumes glabrous.
Culms decumbent-spreading.....2. *S. asperifolius.*
Culms erect.
Panicles diffuse.....3. *S. airoides.*
Panicles contracted, dense.....4. *S. contractus.*

1. **S. confùsus** (Tourn.) Vasey. Culms slender, 1.5 to 2 dm. high, often depauperate; panicles oblong, diffuse, often more than half the length of the entire plant, the branches capillary; glumes about ½ as long as the spikelet, equal, obtuse.—Open sandy or gravelly usually moist ground, Sierra Nevada from Mariposa and Mono Cos. to Nevada Co., 4000 to 7000 ft.; n. to Wash. and Mont., s. to Mex.

2. **S. àsperifòlius** Nees & Meyen. Plants producing slender rhizomes; culms 3 to 6 dm. high, ascending from a creeping or decumbent base; blades flat, 2.5 to 5 cm. long, about 2 mm. wide, scabrous; panicles diffuse, tardily exserted, 10 to 15 cm. long, about as wide; spikelets 1.5 mm. long, the glumes unequal, a little shorter than the spikelet.—Meadows and wet places, especially in alkaline soil, Riverside and n. Ventura Co., e. to Death Valley, thence n. to Lassen Co.; n. to B. C., e. to N. Dak., s. to Mex.; also in S. Am.

3. **S. àiroides** Torr. ALKALI SACATON. Fig. 106. Culms densely tufted, forming large tussocks, smooth, stout, spreading at base, 3 to 9 dm. high; sheaths sparsely pilose at the throat; blades involute, elongate, the upper short; panicles finally about ½ the length of the entire plant; spikelets 1.5 to 2 mm. long, obtuse; first glume oval, ½ as long as spikelet, the second as long as spikelet.—Bottomlands and valleys, often in saline soil: Colorado and Mohave deserts; Amador Co.; Wash. to S. Dak., s. to Mex.

106. Sporobolus airoides Torr.; habit x ¼.

4. **S. contràctus** Hitchc. Culms erect, 6 to 12 dm. high; panicle as much as 30 cm. long; spikelets 2.5 mm. long; first glume less than half as long as the spikelet; second glume as long as spikelet.—Dry soil, Colorado Desert (w. end of Salton Sea); e. to Tex.

49. **CRÝPSIS** Ait.

A spreading annual, with capitate inflorescences in the axils of broad bracts, these being enlarged sheaths with short rigid blades. Spikelets disarticulating below the glumes. Glumes about equal, narrow, acute. Lemma broad, thin. Palea readily splitting between the nerves; seed free from the thin pericarp. (Greek krupsis, hiding, from the partly concealed inflorescence.)

1. **C. acùleàta** (L.) Ait. Plants prostrate, 3 dm. in diameter, or depauperate and only 3 to 5.5 cm. wide; glumes about 2.5 mm. long; lemmas about as long as the glumes, scabrous on keel.—Overflowed lands of the Sacramento and San Joaquin valleys; nat. from Eur.

50. **ORYZÓPSIS** Michx.

Perennials with flat or often involute blades and narrow or open panicles. Spikelets disarticulating above the glumes. Glumes about equal, obtuse or acuminate. Lemma indurate, usually about as long as the glumes, broad, oval or oblong, nearly terete, usually pubescent, with a short blunt callus, and a short deciduous sometimes bent awn. Palea inclosed by the edges of the lemma. (Greek oruza, rice, and opsis, appearance.)

Lemma smooth; spikelets numerous, 3 mm. long; blades flat.....1. *O. miliacea.*
Lemma pilose; blades involute.
Branches of panicle and capillary pedicels divaricately spreading...2. *O. hymenoides.*
Branches of panicle and pedicels erect or ascending.
Glumes about 4 mm. long; lemma sparingly pilose.....5. *O. kingii.*
Glumes 8 to 10 mm. long; lemma densely long-pilose.
Awn 6 mm. long; culms 1.5 to 3 dm. tall.....3. *O. webberi.*
Awn 12 mm. long; culms 3 to 6 dm. tall.....4. *O. bloomeri.*

107. Oryzopsis hymenoides Ricker; habit x ⅓.

1. **O. miliàcea** (L.) B. & H. Culms erect from a decumbent base, 6 to 9 dm. high; sheaths smooth; ligule about 2 mm. long; blades 8 to 10 mm. wide; panicle as much as 30 cm. long, loose, the branches spreading; glumes 3 mm. long, equal; lemma 2 mm. long, the straight awn about 4 mm. long.—Waste places, Los Angeles, Ventura, Santa Barbara, Cahto (Mendocino Co.); sparingly nat. from Eur.

2. **O. hỳmenoìdes** (Roem. & Schult.) Ricker SAND BUNCH GRASS. INDIAN MOUNTAIN RICE. Fig. 107. Culms tufted, 3 to 6 dm. high; ligule about 6 mm. long; blades slender, nearly as long as the culms; panicle diffuse, 8 to 15 cm. long, the capillary branches in pairs, the branchlets dichotomous, all divaricately spreading, the ultimate pedicels flexuous, enlarged below the spikelets; glumes equal, about 6 mm. long, papery, ovate, 3-nerved, abruptly narrowed into an awn-like point; lemma fusiform, turgid, about 3 mm. long, nearly black at maturity, densely long-pilose, with white hairs 3 mm. long; awn about 4 mm. long, straight, readily deciduous.—Deserts and plains, Mohave Desert and northw. on the e. side of the Sierra Nevada to Mt. Shasta; Wash. and Manit. to Tex. and L. Cal.

3. **O. wébberi** (Thurb.) Benth. Culms tufted, erect, 1.5 to 3 dm. high; blades involute, filiform, scabrous; panicle narrow, 2.5 to 5 cm. long, the branches appressed; glumes equal, narrow, obscurely 5-nerved, acuminate, about 8 mm. long; lemma narrow, 6 mm. long, densely long-pilose.—Deserts and dry gravelly stream channels in the mts.: se. Nevada Co.; Lassen Co.; e. to Col.

4. **O. blóomeri** (Boland.) Ricker. Culms tufted, 3 to 6 dm. high; ligule about 1 mm. long; blades crowded at the base, involute, narrow, firm; panicle 8 to 15 cm. long, the branches slender, rather stiffly ascending, bearing spikelets from about the middle; glumes comparatively broad, indistinctly 3 to 5-nerved, rather abruptly acuminate, equal; lemma elliptical, 5 mm. long, densely long-villous; awn tardily deciduous, geniculate, the lower part slightly twisted, appressed-villous.—Dry regions, Modoc Co.; Mt. Diablo; w. Mohave Desert; n. to Wash., e. to Manit. and N. Mex.

5. **O. kíngii** (Boland.) Beal. Culms tufted, slender, 2 to 3.8 dm. high; blades crowded at the base, involute, filiform; ligule about 1 mm. long; panicle narrow, loose, few-flowered; glumes broad, papery, nerveless, obtuse, purple at base, the first about 3.5 mm. long, the second a little longer; lemma elliptic, 3 mm. long, rather sparingly appressed-pubescent, the callus short; awn more or less sickle-shaped, not twisted, minutely pubescent, not readily deciduous, about 12 mm. long.—Dry open ground, Sierra Nevada from Mariposa Co. to Fresno Co., 7000 to 9500 ft.

51. STÌPA L. PORCUPINE GRASS. SPEAR GRASS

Perennials, with usually convolute blades and narrow panicles. Spikelets disarticulating above the glumes, the articulation oblique, leaving a bearded, sharp-pointed callus attached to the base of the floret. Glumes membranaceous, often papery, acute or acuminate, usually long and narrow. Lemma narrow, terete, firm or indurate, strongly convolute, terminating in a bent and twisted prominent persistent awn. Palea inclosed in the convolute lemma. (Greek stupa, tow, referring to the feathery awns of some species.)

Awn plumose.
  Awn with 1 bend, copiously long-plumose below the bend.....1. *S. speciosa.*
  Awn with 2 bends, plumose to second bend.
    Ligule 3 to 6 mm. long.....2. *S. thurberiana.*
    Ligule very short.
      Sheaths pubescent.....3. *S. elmeri.*

Sheaths glabrous.
Blades involute, mostly basal....4. *S. occidentalis.*
Blades flat, tardily involute, scattered....5. *S. californica.*
Awn more or less scabrous, but not plumose.
Lemma clothed with copious hairs 4 mm. long.
Awn with 2 bends; plants 1 m. or more tall....6. *S. coronata*
Awn with usually 1 bend; plant less than 6 dm. tall....7. *S. parishii*
Lemma more or less hairy, the hairs not over 1 mm. long.
Panicle open, the branches naked below, more or less spreading.
Upper glume 5-nerved; lower glume 3 or 5-nerved....8. *S. comata*
Upper and lower glumes 3-nerved.
Ligule evident; terminal segment of awn mostly 4 cm. or more long...
9. *S. pulchra.*
Ligule minute; terminal segment of awn mostly less than 2 cm. long...
10. *S. lepida.*
Panicle narrow, the branches erect.
Glumes 1.5 to 2 cm. long; blades as much as 7 mm. wide..11. *S. stillmanii.*
Glumes 1 cm. or less long.
Sheaths hairy at the throat....12. *S. vaseyi.*
Sheaths not hairy at the throat.
Glumes broad, usually 5-nerved; fruit fusiform...13. *S. lemmoni.*
Glumes narrow, 3-nerved.
Blades short, slender, involute; lemma scarcely 5 mm. long..
14. *S. lettermani.*
Blades commonly elongate, flat; lemma usually more than 5 mm. long....15. *S. minor.*

1. **S. speciòsa** Trin. & Rupr. Culms densely tufted, 3 to 6 dm. high; sheaths smooth, or lower pubescent or felty at the very base, the throat bearded; blades elongate, involute-filiform, mostly basal, more or less deciduous from the outer and older persistent sheaths; panicle narrow, dense, 10 to 15 cm. long, not much exceeding the leaves, white or tawny, conspicuously feathery; glumes smooth, about 1.5 cm. long, 3-nerved, long-acuminate, papery; lemma 7 to 9 mm. long, densely short-pubescent; awn about 4 cm. long.—Deserts and arid hills, especially characteristic species from Mono Co. to the Mohave and Colorado deserts; n. in the South Coast Ranges but rare; s. to L. Cal., e. to Col.; also in Chile.

2. **S. thúrberiàna** Piper. Culms 1.5 to 4.5 dm. high; leaves mostly basal; blades involute, scabrous; panicle 5 to 10 cm. long, often subtended by an enlarged sheath; glumes about 1.2 cm. long, acuminate, 3-nerved; lemma 7 mm. long, appressed-pilose; awn about 4 cm. long.—Open dry woods in the mts., Siskiyou and Modoc Cos.; n. to Wash.

3. **S. élmeri** Piper & Brodie. Culms 6 to 9 dm. high, more or less puberulent, especially at the nodes; blades flat or becoming involute, pubescent on the upper surface, or those of the innovations also on the lower surface; panicle narrow, rather loose, 15 to 40 cm. long; glumes 3-nerved, gradually acuminate, thin, papery, 1.2 to 1.4 cm. long, the first a little the longer; lemma about 7 mm. long, appressed-pubescent; awn 3 to 3.5 cm. long.—Open ground, in the mts., 4000 to 7000 ft.: San Jacinto Mts.; San Bernardino Mts.; Sierra Nevada; n. to Wash.

4. **S. occidentàlis** Thurb. Fig. 108. Culms slender, tufted, 3 to 6 dm. high; blades narrow; panicle narrow, 10 to 20 cm. long; glumes 8 to 10 mm. long, acuminate, 3-nerved; lemma 6 mm. long, long-pilose; awn about 2.5 cm. long, sometimes pilose throughout.—Open dry woods of the Sierra Nevada, 6000 to 9600 ft.; n. to Mt. Shasta; s. to the San Gabriel Mts.; far n. to Wash., e. to Wyo.

108. Stipa occidentalis Thurb.; portion of infl. x 1.

5. **S. califórnica** Merr. & Davy. Culms 6 to 15 dm. high, smooth, or the nodes pubescent; sheaths villous at the throat; panicle narrow, usually 30 to 45 cm. long, the branches fascicled, appressed; glumes thin, papery, about 1 cm. long, 3-nerved, the lateral nerves rather indistinct; lemma about 6 mm. long, appressed-villous; awn 2 to 3 cm. long.—Meadows and open woods, 6000 to 8000 ft.: San Jacinto Mts.; Sierra Nevada from Nevada Co. to Mariposa Co.; n. to Ore.

6. **S. coronàta** Thurb. Culms robust, commonly 12 to 18 dm. high, smooth or pubescent below the nodes;

sheaths smooth, the margin and throat villous; ligule about 2 mm. long, ciliate-margined; blades elongate, flat, with a slender involute point; panicle narrow, dense, purplish, thick, 30 to 45 cm. long; glumes gradually acuminate, 3-nerved, the first about 2 cm. long, the second 2 to 4 mm. shorter; lemma 8 to 10 mm. long; awn about 3.5 cm. long.—Open ground, Santa Lucia Mts to cismontane S. Cal.; s. to L. Cal.

7. **S. parishii** Vasey. Culms stout, 3 to 6 dm. high; sheaths smooth, villous at the throat; ligule short, ciliate; blades firm, flat, with a slender involute point, very scabrous above, about 4 mm. wide; panicle 15 to 20 cm. long, narrow, dense, purple-tinged; glumes 3-nerved, long-acuminate, the first 1.4 cm. long, the second 2 mm. shorter; lemma 7 mm. long, densely long-villous, especially above; awn about 2.5 cm. long.—Open ground: San Diego Co.; San Jacinto Mts.; San Bernardino Mts.; w. Nev.

109. Stipa comata Trin. & Rupr.; panicle x ⅓.

8. **S. comàta** Trin. & Rupr. NEEDLE-AND-THREAD. Fig. 109. Culms 6 to 12 dm. high, smooth; sheaths smooth; ligule 4 to 6 mm. long; blades becoming involute, elongate; panicle loose, 15 to 25 cm. long; branches slender, ascending, or in anthesis spreading, bearing usually 2 spikelets toward the ends; glumes about 2.5 cm. long, gradually narrowed into an awn, thin, papery; lemma 1 to 1.2 cm. long, rather sparsely appressed-villous; callus 3 mm. long; awn 8 to 12 cm. long, twice bent and flexuous.—Dry open ground: Argus Mts.; White Mts.; Lake Tahoe; n. to Wash., e. to the Great Plains.

9. **S. púlchra** Hitchc. Culms 6 to 9 dm. high; blades long, narrow, flat or involute; ligule about 1 mm. long; panicle about 15 cm. long, loose, the branches spreading, slender, some of the lower 2.5 to 5 cm. long; glumes narrow, long-acuminate, purplish, the first about 2 cm. long, the second 2 to 4 mm. shorter; lemma 8 mm. long, sparingly pilose; awn 5 to 8 cm. long, short-pubescent to the second bend.—Open ground at low altitudes: common in the Coast Ranges; Sierra foothills; s. to San Diego Co. and L. Cal. (S. setigera of authors.)

10. **S. lépida** Hitchc. Culms slender, puberulent below the nodes, 6 to 9 dm. high; sheaths sparingly villous at throat; blades flat, narrow, 2 to 4 mm. wide, pubescent on upper surface near base; panicle rather loose, usually 15 to 20 cm. or sometimes more than 30 cm. long, the branches distant, slender; glumes acuminate, the first 6 to 10 mm. long, the second about 2 mm. shorter; lemma about 6 mm. long, sparingly villous, nearly glabrous toward the hairy-tufted apex; awn indistinctly twice bent, 2.5 to 4 cm. long, scabrous.—Open ground, Berkeley Hills to San Bernardino and San Diego; s. to L. Cal. (S. eminens of authors.) Var. ANDERSÒNII (Vasey) Hitchc. Differs chiefly in the slender involute blades; plant on the average smaller, with narrower few-flowered panicles, the spikelets usually smaller.—Range about that of the species but extending n. to Mt. Shasta.

11. **S. stillmánii** Boland. Culms stout, 6 to 9 dm. high; sheaths puberulent at the throat and collar; ligule very short; blades folded or involute, firm, the uppermost filiform; panicle dense or interrupted at base, the branches short fascicled; glumes equal, 2 to 3 cm. long, papery, minutely scabrous, acuminate into a scabrous awn-point, the first 3-nerved, the second 5-nerved; lemma 9 mm. long, short-pilose, with 2 slender teeth at the summit, the callus short; awn about 2.5 cm. long, once or indistinctly twice-geniculate.—Blue Cañon, Placer Co., only known station.

12. **S. vàseyi** Scribn. SLEEPY GRASS. Culms 6 to 9 dm. high; blades elongate, involute; panicle about 30 cm. long, dense; glumes acuminate, scabrous, the first a little longer, rather strongly 5 to 7-nerved, 1 cm. long; lemma about 6 mm. long, appressed-pilose, the callus short; awn twice-geniculate,

about 2.5 cm. long, minutely puberulent.—San Nicolas Isl.; Ariz. to Col., Tex. and Mex.

13. **S. lemmòni** (Vasey) Scribn. Culms 6 to 9 dm. high, sometimes pubescent below the nodes; ligule about 1 mm. long; blades usually flat, pubescent on upper surface; panicle loose, 10 to 15 cm. long; glumes subequal, scarious, acuminate, 1.2 cm. long; lemma 7 mm. long, rather thinly appressed-pilose, the callus short; awn about 2.5 cm. long, twice-geniculate, appressed-pilose to the second bend.—Open woods, Mendocino Co.; Sierra Nevada from the Tehachapi Range to Siskiyou Co.; n. to Wash. Var. JÒNESII Scribn. Differs in the more slender firm involute blades, and smaller spikelets; glumes about 8 mm. long; lemma about 6 mm. long, the awn 2 cm. long, tending to be incurved, the pubescence shorter.—Mts. of San Diego Co.; Sierra Nevada from Mariposa Co. to Siskiyou Co.; n. to Wash. and Ida.

14. **S. léttermani** Vasey. Culms tufted, slender, 3 to 4.5 dm. high; ligule very short; leaves crowded at base; panicle 7 to 20 cm. long; glumes acuminate, about 8 mm. long; lemma 5 mm. long, pilose; awn very slender, about 1.2 cm. long, nearly smooth, twice bent.—Dry soil, higher altitudes, 5800 to 7000 ft.: San Bernardino Mts.; Sierra Nevada from Nevada Co. to Sierra Co.; Ore. to Ida. and Col.

15. **S. mìnor** (Vasey) Scribn. Culms in small tufts, 6 to 9 dm. high; ligule very short; blades flat or becoming involute, narrow, up to 30 cm. long; panicle 15 to 20 cm. long; glumes 6 mm. long; lemma pilose; awn 1 to 1.5 cm. long, nearly smooth, twice bent.—Open ground, 7000 to 10,000 ft., Sierra Nevada from Tulare Co. to Nevada Co.; n. to Wash., e. to Col.

52. **ARÍSTIDA** L. Needle Grass

Annuals or perennials with narrow, often convolute blades and narrow or sometimes open panicles. Spikelets disarticulating above the glumes. Glumes narrow, acute, acuminate, or awn-tipped. Lemma indurate, narrow, terete, convolute, with a hard sharp-pointed minutely bearded callus at base, terminating above in a usually trifid awn. (Latin arista, awn.)

Neck of fruit jointed at base.....1. *A. californica.*
Neck of fruit not jointed at base.
  Lateral awns wanting or reduced to mere points.....2. *A. schiedeana.*
  Lateral awns evident.
    Panicle diffuse, open, the main branches usually horizontally spreading; glumes about equal; plants perennial.....3. *A. divaricata.*
    Panicle narrow, somewhat open, the branches not divaricate.
      Plants annual.
        Glumes 2 to 3 cm. long, nearly equal; awns 4 to 7 cm. long.....4. *A. oligantha.*
        Glumes not over 1 cm. long, the lower about half as long as the upper; awns about 1 cm. long.....5. *A. adscensionis.*
      Plants perennial.
        Glumes nearly equal.....6. *A. parishii.*
        Glumes unequal, the first ½ to ⅔ as long as the second.
          Neck of fruit slender, straight or slightly twisted, about as long as the body; panicle narrow, strict.....7. *A. reverchoni.*
          Neck of fruit short or not differentiated from the body.
            Pedicels slender, more or less recurved.....8. *A. purpurea.*
            Pedicels stiffly erect.
              Panicle short, few-flowered; no ciliate line on collar of leaf.....9. *A. fendleriana.*
              Panicle elongate, many-flowered; collar of leaf with pubescent line.....10. *A. wrightii.*

1. **A. califórnica** Thurb. Perennial; culms tufted, much-branched at base, 1.5 to 3 dm. high; blades short, involute, sharp-pointed; panicles numerous, loose, 2.5 to 5 cm. long, few-flowered; glumes smooth or the first slightly scabrous near apex, 8 mm. long, the second about twice as long; lemma 6 mm. long, the narrowed apex articulated with the slender spirally twisted base of the awns, the base 1.8 cm. long; awns equal, spreading, about 2.5 cm. long.—Colorado Desert and e. Mohave Desert to n. Mex.

2. **A. schiedeàna** Trin. & Rupr. Perennial; culms erect, scaberulous, 3 to 6 dm. high; sheaths scaberulous, villous at the throat; blades involute in drying, the persistent basal ones flat and flexuous, 10 to 20 cm. long; panicle somewhat open, about half the entire height of the plant, the lower branches

slender, ascending or spreading; glumes acuminate or short-awned, the first longer, about 1 cm. long; neck of fruit twisted, 5 to 8 mm. long, the central awn spreading, 7 to 10 mm. long; fruit, including neck, 15 to 18 mm. long.—Deserts and rocks, Ariz. to N. Mex. and Mex.; probably in the Colorado Desert, recorded from San Diego.

3. **A. divaricàta** Humb. & Bonpl. Culms tufted, erect, 3 to 6 dm. high; blades involute, as much as 15 cm. long; panicle usually more than ½ the entire length of the plant; branches distant, mostly in pairs, spikelet-bearing toward the ends; glumes 1 to 1.2 cm. long, short-awned, the first scabrous on the keel; lemma about 1 cm. long, scabrous toward the scarcely narrowed apex; awns about equal, 1.2 to 2 cm. long, somewhat spreading.—Deserts and rocky hills, Bakersfield to Los Angeles and San Diego; e. to Tex. and Mex. Variable in length of awns.

4. **A. oligàntha** Michx. Culms erect, branched at base and all the nodes, 3 to 6 dm. high, often woolly at the very base; blades usually involute, as much as 15 cm. long, sparingly pilose at base, the prophyllum often conspicuous at base of branches; panicles narrow, loosely few-flowered, bearing a few scattered large appressed short-pediceled spikelets; glumes long-awned from a bifid apex, the first strongly 5 to 7-nerved; lemma a little shorter than the glumes, the gradually narrowed neck scaberulous, the callus rather minutely pubescent; awns about equal, widely spreading, 4 to 7 cm. long.—Open ground, e. side of the Great Valley (Merced Falls; lower Mokelumne River; Chico); Ore.; middle and e. U. S.

110. Aristida adscensionis L.; *a*, habit x ⅓; *b*, glumes x 2½; *c*, floret x 2½.

5. **A. adscénsiònis** L. DOGTOWN GRASS. Fig. 110. Culms much-branched at the base, 1 to 3 dm. high, erect or prostrate; blades 2.5 to 5 cm. long, usually involute; panicle narrow, rather dense, 5 to 8 cm. long, the branches short, fascicled; glumes 1-nerved, obtuse or slightly mucronate; lemma 8 to 10 mm. long, the callus with a dense tuft of short hairs, the apex scarcely narrowed; awns flat at base, equal, finally spreading, about 1 cm. long.—Open ground, San Luis Obispo Co. to San Diego Co., e. to Inyo Co. and the Colorado River; e. to N. Mex., s. to S. Am.; Mediterranean region and Afr. Also called Six-weeks Grass. (A. bromoides H.B.K.)

6. **A. parishii** Hitchc. Culms tufted, 3 to 6 dm. high; sheaths ciliate at the throat; blades firm, flat or more or less involute, scabrous on the upper surface, smooth below or scabrous toward the tip, 1.5 to 3 dm. long; panicle narrow, about 15 cm. long, the branches rather stout, ascending or appressed; glumes short-awned, 1-nerved or the first 3-nerved, the second 1.2 cm. long; lemma a little shorter than the glumes, very scabrous on the upper half, the neck rather stout, not twisted, the awns ascending, the central about 2 cm. long, the lateral a little shorter.—Dry ground, Palm Sprs. of Mt. San Jacinto to Riverside and s. to San Diego.

7. **A. revérchoni** Vasey. Culms densely tufted, erect 3 to 6 dm. high; blades involute, more or less flexuous, as much as 15 cm. long; panicle 10 to 15 cm. long; glumes awnless, the first about 6 mm. long, the second about 10 mm. long; lemma 1 to 1.2 cm. long; awns equal, about 2 cm. long.—Deserts and plains, e. Mohave Desert; e. to Tex.

8. **A. purpùrea** Nutt. Culms tufted, erect, about 6 dm. high; blades flat or involute, 5 to 12 cm. long; panicles 10 to 15 cm. long, rather loose; glumes short-awned, 1-nerved, the first 6 mm. long, the second about twice as long; lemma about 1 2 mm. long, purple, strongly scabrous in lines, the apex somewhat narrowed, flattened and slightly twisted; awns equal, 3 to 3.5 cm. long.—Plains and deserts: cismontane S. Cal., e. to the Colorado River; far e. to Tex.

9. **A. féndleriàna** Steud. Plants forming dense cushions, the crowded blades curly, involute, arcuate, sharp-pointed, pilose at base, usually 2.5 to 5 cm. long, sometimes longer; culms 1.5 to 3 dm. high; panicle narrow, 5 to 10 cm. long, bearing a few, mostly short-pediceled, loosely arranged, more or less appressed spikelets; glumes awnless, 1-nerved, the first about 6 mm. long, the second 10 to 12 mm. long; lemma 8 mm. long, scaberulous and slightly narrowed above; callus 1 mm. long; awns equal, about 2.5 cm. long, ascending.—Deserts and plains: ne. (desert) side of the San Bernardino Mts., 6000 to 7000 ft.; e. to Tex.

10. **A. wrìghtii** Nash. Culms tufted, erect, 6 dm. high, wiry; blades involute, often curved; panicle 10 to 20 cm. long, the longer branches bearing 2 to 4 spikelets; spikelets 1.2 to 1.4 cm. long; glumes 1-nerved, the first half as long as the second; awns ascending, the central a little longer, about 2.5 cm. long.—Dry soil, Split Mt., Colorado Desert; e. to Tex.

Tribe 5. **Nazìeae.** Curly-Mesquite Tribe

Spikelets sessile in groups of 3, the group falling entire from the continuous axis, the perfect spikelet 1-flowered, the staminate 2-flowered; glumes usually firmer than the lemma and palea, sometimes awned, the lemma awnless.

53. **HILÀRIA** H. B. K.

Stiff perennials, the groups of spikelets appressed to the axis, in terminal spikes. Spikelets sessile, in groups of 3, the groups falling from the axis entire, the central spikelet (next the axis) fertile, 1-flowered, the 2 lateral spikelets staminate, 2-flowered. Glumes coriaceous, those of the 3 spikelets forming a false involucre, in some species connate at the base, more or less asymmetric, usually bearing an awn on one side from about the middle. Lemma and palea hyaline, about equal in length. (August de St. Hilaire. French botanist.) (Pleuraphis Torr.)

Culms felty pubescent.....1. *H. rigida.*
Culms glabrous or nearly so.....2. *H. jamesii.*

1. **H. rígida** (Thurb.) Benth. Galleta. Fig. 111. Plants grayish, felty-pubescent throughout; culms numerous from woody rhizomes, 4.5 to 9 dm. high; blades 2.5 to 6 cm. long, 2 to 4 mm. wide, more or less involute, rigid, sharp-pointed; spikelets about 8 mm. long; glumes of central spikelet broadened upward from a narrow base, woolly-ciliate, several-awned from the tip, a stronger dorsal awn from about the middle; lemma 3-nerved, inclosing the palea and a rudimentary second floret, the nerves villous on the back, extending into delicate awns between the ciliate lobes of the apex; lateral spikelets similar, narrower, the glumes less awned, the second floret similar to the first. —Mohave and Colorado deserts; Ariz. to Mex. The most valuable forage grass in the desert.

111. Hilaria rigida Benth.: *a*, habit x 1; *b*, infl. x 1.

2. **H. jàmesii** (Torr.) Benth. Culms erect from stout rhizomes, glabrous, the nodes villous; sheaths 2.5 to 4 cm. long, sparingly villous at the throat; blades mostly 2 to 4 mm. wide, rigid, soon involute, the upper reduced; spikelets 6 to 8 mm. long, long-villous at base; glumes of central spikelet pubescent, cuneate, 2-lobed, the lobes 2 or 3-awned, the central nerve between, extending from below the middle into an awn somewhat longer than the others, the awns all minutely plumose; lemma erose at apex, glabrous, 3-nerved, the nerves parallel, the central extending into a short awn; glumes of lateral spikelets narrow, pubescent, the first unsymmetrical, 5-nerved, the second nerve on one side extending into a dorsal awn from below the

middle, the apex unequally 2-lobed, the sinus extending down about half-way to the point of departure of the awn, the lobes minutely ciliate; second glume 5-nerved, awnless, entire, ciliate, conduplicate around the floret; lemma as in fertile spikelet.—Deserts of Inyo Co.; e. to Wyo. and Tex.

TRIBE 6. **Chlorídeae.** GRAMA TRIBE

Spikelets 2 to several-flowered, sessile or short-pediceled, approximate or somewhat distant along one side of a slender rachis, the rachilla disarticulating above the glumes and between the florets; glumes unequal or nearly equal, awnless or mucronate, 1-nerved, usually shorter than the first lemma; lemmas obtuse or acute, sometimes 2-toothed and mucronate or short-awned from between the teeth, 3-nerved, the nerves sometimes pubescent.

54. LEPTÓCHLOA Beauv.

Our species annuals with flat blades and numerous spikes or racemes scattered along a common axis, forming a panicle. Spikelets 2 to several-flowered, subsessile, approximate or somewhat distant along one side of a slender rachis. Glumes unequal or nearly equal, 1-nerved, usually shorter than the first lemma. Lemmas obtuse or acute, sometimes 2-toothed and mucronate or short-awned from between the teeth, 3-nerved, the nerves sometimes pubescent. (Greek leptos, slender, and chloa, grass.)

Glumes longer than first lemma; sheaths papillose-hispid ..... 1. *L. filiformis.*
Glumes shorter than first lemma; sheaths smooth.
Lemmas awned ..... 2. *L. fascicularis.*
Lemmas awnless ..... 3. *L. uninervia.*

112. Leptochloa filiformis Beauv.; *a*, habit x ¼; *b*, glumes x 3; *c*, florets x 3.

1. **L. filifórmis** (Lam.) Beauv. FEATHER GRASS. Fig. 112. Culms 3 to 9 dm. high, often depauperate; spikes numerous, slender, 2.5 to 10 cm. long, usually purple, the spikelets rather distant, about 3 mm. long; glumes more or less mucronate, nearly equaling the 3 or 4 awnless florets.—Open ground, fields and moist depressions, Imperial Co.; common in the warmer parts of Am.

2. **L. fásciculàris** (Lam.) Gray. Culms erect or spreading, 3 to 6 dm. high; blades erect, as long or longer than the culms; spikes numerous, 7 to 12 cm. long; spikelets 7 to 11-flowered, the florets much longer than the lanceolate glumes; lemmas hairy-margined toward the base, short-awned from the toothed apex.—Ditches and moist, especially alkaline soil, Fresno and Kern Cos., rare; e. to Md. and Fla.; also trop. Am.

3. **L. uninérvia** (Presl) Hitchc. & Chase. Resembles no. 2; usually strictly erect, the panicle more oblong in outline, with shorter commonly dull purplish spikes; glumes broader and more obtuse; lemmas apiculate but not awned.—Ditches and moist places: San Bernardino Mts.; Colorado Desert; e. to La., s. to Mex. (L. imbricata Thurb.)

ELEUSÌNE ÍNDICA (L.) Gaertn., Goose Grass, a spreading smooth weedy annual with thick digitate spikes of crowded several-flowered spikelets, has been found near Los Angeles; native of the Old World.

55. CÝNODON Rich.

Usually low perennials with creeping stolons or rhizomes, short blades, and several slender spikes digitate at the summit of the upright flowering culms. Spikelets 1-flowered, sessile, the rachilla prolonged behind the palea, sometimes bearing a rudimentary lemma. Glumes narrow, acuminate, 1-nerved, about equal, shorter than the floret. Lemma strongly compressed, pubescent on the keel, firm, 3-nerved, the lateral nerves close to the margins. (Greek kuon, a dog, and odous, tooth.) (Capriola Adans.)

1. **C. dáctylon** (L.) Pers. BERMUDA GRASS. DEVIL GRASS. Fig. 113. Culms flattened, wiry, glabrous; ligule a conspicuous ring of white hairs; spikes

113. Cynodon dactylon Pers.; stolon and infl. x ½.

4 to 6, 2.5 to 6 cm. long; spikelets imbricate, 2 mm. long. —Moist valley fields and along irrigating ditches; native of warmer parts of Old World.

56. **BECKMÁNNIA** Host

An erect rather stout annual with flat blades and numerous short appressed pedunculate spikes in a narrow more or less interrupted panicle. Spikelets 1-flowered, rarely 2-flowered, laterally compressed, subcircular, nearly sessile and closely imbricate, disarticulating below the glumes, falling entire. Glumes equal, inflated, obovate, 3-nerved, strongly gibbous above, the apex apiculate. Lemma narrow, 5-nerved, acuminate, about as long as the glumes. Palea nearly as long as the lemma. (Johann Beckmann, 1739-1811, professor of botany at Göttingen.)

1. **B. erùcaefórmis** (L.) Host. Slough Grass. Fig. 114. Plants light green; culms 3 to 9 dm. high; panicle 10 to 25 cm. long; spikelets 3 mm. long; glumes transversely wrinkled, the acuminate apex of the lemma protruding.—Moist ground and ditches, San Francisco Bay to Siskiyou and Lassen Cos.; cooler parts of northern hemisphere.

114. Beckmannia erucaeformis Host; habit x ⅓.

57. **SPARTÌNA** Schreb.

Stout erect tall perennials, with extensively creeping firm scaly rhizomes, long tough blades, and two to many appressed or sometimes spreading spikes racemose on the main axis. Spikelets 1-flowered, much flattened laterally, sessile and usually closely imbricate, disarticulating below the glumes, the rachilla not produced beyond the floret. Glumes keeled, 1-nerved, acute or short-awned, the first shorter, the second often exceeding the lemma. Lemma firm, keeled, the lateral nerves obscure, narrowed to a rather obtuse point. Palea keeled and flattened, the keel between or at one side of the nerves. (Greek spartion, a cord, referring to the tough leaves.)

115. Spartina gracilis Trin.; *a*, habit x 1-7; *b*, spikelet x 3; *c*, floret x 3.

Spikes closely approximate, forming a cylindrical inflorescence; blades wide, flat below.....1. *S. foliosa.*

Spikes distinct; blades narrow and soon involute..... 2. *S. gracilis.*

1. **S. foliòsa** Trin. Culms as much as 1.5 cm. thick at base, usually rooting from the lower nodes, 3 to 12 dm. high, somewhat spongy; blades 8 to 12 mm. broad at the flat base, gradually narrowed to a long involute tip, smooth; inflorescence dense, spike-like, about 15 cm. long; spikes numerous, close-appressed, 2.5 to 5 cm. long; spikelets indurated, about 1.2 cm. long; glumes ciliate on keel, acute, the first narrow, about ⅔ as long as second, smooth, the second sparingly hispidulous, striate-nerved; lemma hispidulous on sides, smooth on keel, a little shorter than the second glume; palea longer than lemma.—Salt marshes and tidal flats along the coast, San Francisco Bay to San Diego. Useful in reclaiming marshland.

2. **S. grácilis** Trin. Fig. 115. Culms 6 to 9 dm. high; blades 15 to 20 cm. long, very scabrous

above; spikes 4 to 8, closely appressed to the axis, 2 to 2.5 cm. long; spikelets about 6 mm. long; glumes smooth except the ciliate keel, acute, the first about ½ as long as the second; lemma about as long as second glume, ciliate on keel; palea as long as lemma, obtuse.—Alkaline meadows, Inyo Co.; n. to Wash. and Saskat.

58. **CHLÒRIS** Swartz

Perennials or annuals with flat blades and two to several digitate spikes. Spikelets with 1 perfect floret, sessile, the rachilla produced beyond the perfect floret and bearing 1 to several reduced florets consisting of empty lemmas, these often truncate, and, if more than one, the smaller ones inclosed in the lower, forming a usually club-shaped rudiment. Glumes somewhat unequal, the first shorter, narrower, acute. Lemma keeled, usually broad, 1 to 5-nerved, often villous on the callus and villous or long-ciliate on the keel or marginal nerves, awned from between the short teeth of a bifid apex, the awn slender or sometimes reduced to a mucro, the sterile lemmas awned or awnless. (Latin Chloris, the goddess of flowers.)

1. **C. virgàta** Swartz. Fig. 116. Culms erect or spreading, 3 to 9 dm. high; sheaths much compressed, especially the basal, the uppermost often inflated around the base of the inflorescence; spikes 6 to 12, 2.5 to 8 cm. long, flexuous at summit; spikelets imbricate; glumes 1-nerved, the second about 3 mm. long, awn-pointed; lemma somewhat fusiform, about 2 mm. long, 3-nerved, short pilose at base and along the lower half of the keel, long-pilose on the margins near the apex, with a slender straight awn about 1 cm. long, from just below apex; rudiment reaching about to tip of fertile floret, truncate, the awn somewhat shorter.—Fields and waste places, Riverside to the Colorado Desert; extends to W. I. and Brazil. (C. elegans H.B.K.)

116. Chloris virgata Sw.; *a*, infl. x ½; *b*, glumes x 5; *c*, florets x 5.

C. VÉRTICILLÀTA Nutt., Windmill Grass, a low perennial with long stiff divergent slender spikes, has been found at Berkeley; adv.; native of Tex.

59. **BOUTELOÙA** Lag. GRAMA GRASS

Low or rather tall perennials or annuals with two to many spikes racemose on a common axis (sometimes solitary), the spikelets few to many in each spike, pectinate or more loosely arranged and appressed, the rachis of the spike usually produced beyond the insertion of the spikelets. Spikelets 1-flowered, with the rudiments of one or more florets above. Glumes 1-nerved, acuminate or awn-tipped, the first shorter and narrower. Lemma as long as the second glume or a little longer, 3-nerved, the nerves extending into awns, the internerves usually extending into teeth. Palea sometimes 2-awned; rudiment various, usually 3-awned, a second rudimentary floret sometimes present. (The brothers Claudio and Esteban Boutelou, Spanish gardeners.)

Spikes containing 1 to 3 spikelets, numerous along a main axis; spikes falling entire.
  Plants perennial.....1. *B. curtipendula.*
  Plants annual.....2. *B. aristidoides.*
Spikes usually few, containing numerous spikelets; florets falling from the glumes; rachis of spike persistent except in no. 6.
  Plants annual.
    Awns about 3 mm. long; spikes 2 to 4.....3. *B. arenosa.*
    Awns barely protruding; spikes 4 to 6 or more.....4. *B. barbata.*
  Plants perennial; tufted bunchgrasses.
    Spikes several.
      Spikes narrow, strictly 1-sided; spikelets numerous.....5. *B. rothrockii.*
      Spikes broad, loose, irregularly 1-sided; spikelets few.....6. *B. radicosa.*

Spikes usually 1 to 3, rarely 4.
Rachis not prominently produced; second glume sparsely hairy..... *7. B. gracilis.*
Rachis produced beyond the spikelets as a naked point; second glume prominently tuberculate-hispid on the keel..... *8. B. hirsuta.*

1. **B. curtipéndula** (Michx.) Torr. SIDE-OAT GRAMA. TALL GRAMA. Culms erect, 3 to 12 dm. high; spikes numerous on an elongated rachis, 1 to 2 cm. long, reflexed, mostly turned to one side; glumes narrow, scabrous on keel and somewhat so on the back, the second about 5 mm. long; lemma as long as second glume, ovate-lanceolate, scabrous toward tip, 3-toothed, the palea about as long; rudiment as long as lemma, 4-lobed, 3-awned between the lobes, the lateral lobes and awns shorter, the rudiment sometimes much reduced.—Plains and rocky hills, Santa Rosa Mt., Riverside Co.; Mont. to Mex.

2. **B. arístidoìdes** (H.B.K.) Griseb. NEEDLE GRAMA. Culms spreading, slender, 1.5 to 3.8 dm. high; spikes several, slender, about 1.2 cm. long, the 1 to 3 spikelets distant, appressed to the rachis, the latter ending in a slender naked point; glumes narrow, the first ½ as long as the second; lemma narrowly lanceolate, the nerves pilose, the lateral ending in awned teeth as long as the central acuminate point; rudiment consisting of a pilose stipe and 3 awns longer than the spikelet.—Open ground, deserts and foothills: e. Riverside Co.; Colorado Desert; e. to Tex., s. to S. Am.

3. **B. arenòsa** Vasey. Culms spreading or prostrate, about 1.5 dm. high; spikes many-flowered, about 1.2 cm. long; first glume 2 mm., the second 3 mm. long; lemma a little shorter than the second glume, pilose below, 4-lobed, the lateral lobes short, 3-awned from between the lobes, the awns about 3 mm. long; palea 4-toothed, 2-awned; rudiment 1 mm. long, triangular-truncate, pilose at base, 4-lobed, with 3 long awns between the lobes.—Loose sandy soil, Cargo Muchacho, Colorado Desert; e. to N. Mex., s. to Mex.

4. **B. barbàta** Lag. SIX-WEEKS GRAMA. Culms spreading or prostrate, 1.5 to 3 dm. high; spikes 1.2 to 2 cm. long; spikelets numerous, imbricate; glumes scabrous on keel and somewhat so on back, awn-pointed from a toothed apex, the second twice as long as the first, 3 mm. long; lemma pilose below, 3-awned, the central awn between the obtuse scabrous lobes; rudiment pilose at base, 2-lobed, 3-awned.—Desert valleys, lower Colorado River; e. to Utah, s. to Mex.

5. **B. rothróckii** Vasey. Culms erect or spreading, 3 to 6 dm. high; spikes usually 4 to 6, 1.2 to 2.5 cm. long; spikelets numerous, imbricate; glumes scabrous on keel and back, cuspidate and 2-toothed at apex, the second 2.5 mm. long, about twice as long as the first; lemma pilose below, 4-lobed, 3-awned, the awns equal, 2.5 mm. long; rudiment pilose at base, consisting of 2 short truncate lobes, 3 equal awns about 2 mm. long, and an included orbicular scale.—Mesas and foothills, Jamacha, San Diego Co.; e. to Utah, s. to Mex.

6. **B. radicòsa** (Fourn.) Griff. Culms 1.5 to 6 dm. high, erect; blades mostly basal, flat; spikes several to many, 2 to 2.5 cm. long; glumes rather broad, the second about 6 mm. long; lemma smooth, bearing 3 short awns; rudiment lanceolate, with 3 long awns.—Upper foothills and mountains, Ariz. and N. Mex. to Mex.; collected by Orcutt in Cal., probably in the Colorado Desert.

7. **B. grácilis** (H.B.K.) Lag. BLUE GRAMA. Culms erect, 1.5 to 4.5 dm. high; sheaths and blades glabrous; spikes 1 to 3, 2.5 to 5 cm. long, usually a little curved; spikelets 5 to 6 mm. long, densely crowded, pectinate; glumes narrow, the first about ½ as long as the second, the latter sparsely papillose-pilose on the keel; lemma pilose, 3-cleft, the lateral divisions awned, the terminal 2-toothed, awned between the teeth; rudiment 3-awned, pilose at base, a second rudimentary scale above.—Mts. and mesas of S. Cal. from the San Bernardino Mts. to San Diego Co.; extends from Manit. and Mont. to Mex.

8. **B. hirsùta** Lag. HAIRY OR BLACK GRAMA. Fig. 117. Culms erect, 2 to 4.5 dm. high; sheaths smooth; blades sparsely papillose-hairy, especially on the margins; spikes 1 to 4, 1.8 to 5 cm. long; first glume narrow, setaceous:

117. Bouteloua hirsuta Lag.; infl. x ½.

second glume acuminate, twice as long as first, equaling the floret; lemma pubescent, 3-cleft; rudiment of 2 obtuse lobes and 3 equal awns, not pilose at base.—Mesas and dry hills, Jamacha, San Diego Co.; B. C. and S. Dak. to Mex.

TRIBE 7. **Phalarídeae.** CANARY GRASS TRIBE

Spikelets with one perfect terminal floret, and below this, a pair of staminate or neuter florets, the rachilla disarticulating above the glumes, the sterile florets falling attached to the fertile one.

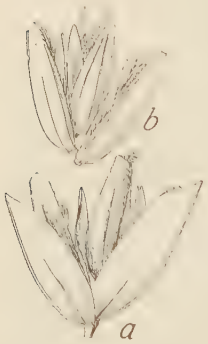
60. **TORRÈSIA** R. & P. HOLY GRASS

Perennial low erect sweet-smelling grasses with small panicles of bronze-colored spikelets. Spikelets with one perfect floret and two staminate florets. Glumes equal, broad, thin and papery, smooth, acute. Sterile lemmas about as long as the glumes, mostly somewhat appressed-hispid. Fertile lemma somewhat indurate, about as long as the others, smooth or nearly so, awnless. (Hieronymus de la Torre, Spanish botanist.) (Hierochloe R. Br.)

1. **T. macrophýlla** (Thurb.) Hitchc. CALIFORNIA VANILLA GRASS. Fig. 118. Culms few, erect, 6 to 9 dm. high; sheaths scabrous; blades crowded toward base, flat, rather stiffly upright, scabrous above, glaucous beneath, acuminate-pointed, 6 to 14 mm. wide; panicle somewhat open, 8 to 12 cm. long, the lower branches spreading or drooping; glumes 4 mm. long.—Redwood belt from Monterey Co. to Humboldt Co.; n. to Wash.

61. **ANTHOXÁNTHUM** L.

Sweet-smelling annuals or perennials, with flat blades and spike-like panicles. Spikelets with 1 perfect floret and 2 sterile lemmas. Glumes unequal, acute or mucronate. Sterile lemmas shorter than the glumes, empty, awned from the back. Fertile lemma shorter than the sterile ones, awnless. Palea 1-nerved, rounded on the back, inclosed in the lemma. (Greek anthos, flower, and xanthos, yellow.)



118. Torresia macrophylla Hitchc.; *a*, spikelet; *b*, florets. x 5.

1. **A. odoràtum** L. SWEET VERNAL GRASS. Fig. 119. Perennial; culms slender, erect, 2 to 6 dm. high; panicle 4 to 8 cm. long, pointed; spikelets brownish green, 8 to 10 mm. long; glumes sparsely pilose; first sterile lemma short-awned below the apex, the second bearing a strong bent scarcely exserted awn near its base.—Meadows and waste ground, Humboldt and Del Norte Cos.; nat. from Eur.

119. Anthoxanthum odoratum L.; *a*, habit x ½; *b*, spikelet x 2½; *c*, florets x 2½.

62. **PHÁLARIS** L.

Erect annuals or perennials, with flat blades and spike-like panicles. Spikelets laterally compressed, with 1 perfect floret and 2 reduced sterile lemmas, usually in dense spike-like panicles. Glumes equal, boat-shaped, often winged on the keel. Sterile lemmas reduced to 2 small scales (rarely only 1). Fertile lemma coriaceous, shorter than the glumes, inclosing the palea. (Ancient Greek name for some grass.)

Spikelets in groups of 7, 1 fertile surrounded by 6 sterile.....1. *P. paradoxa.*
Spikelets single, all alike.
  Plants perennial.
    Rhizomes absent; panicle dense, ovate or oblong.....2. *P. californica.*
    Rhizomes present; panicle spreading during anthesis.....3. *P. arundinacea.*
  Plants annual.
    Glumes broadly winged; panicle ovate or short-oblong.....4. *P. minor.*
    Glumes wingless or nearly so; panicles oblong or linear, dense.
      Glumes acuminate; fertile lemma turgid, the acuminate apex smooth.....
        5. *P. lemmoni.*
      Glumes acute; fertile lemma less turgid, villous to the acute apex.
        Panicle 2.5 to 5 cm. long; sterile lemmas ⅓ as long as fertile.....
          6. *P. caroliniana.*
        Panicle 5 to 12 cm. long; sterile lemmas ½ as long as fertile.....
          7. *P. angusta.*

1. **P. paradóxa** L. GNAWED CANARY GRASS. Annual; culms tufted, more or less spreading at base, 3 to 6 dm. high; panicle dense, narrowed at base, 2.5 to 5 cm. long, often inclosed at base in the uppermost enlarged sheath; spikelets falling in groups of 7, the central fertile, nearly sessile, the others sterile, slender-pediceled; glumes of sterile spikelets narrow, with faint lateral nerves, the keel prominently winged above, the wing extending into a more or less well-marked tooth, the apex of the glume narrowed into an acuminate point or awn, the glumes of the 4 outer sterile spikelets in the lower part of the panicle more or less deformed into knobs; glumes of fertile spikelet lanceolate, 6 to 8 mm. long, the lateral nerves prominent, the wing on the keel more tooth-like, the apex of the glume narrowed into an awn about 2 mm. long; fertile lemma smooth, shining, 3 mm. long, the sterile lemmas obsolete.—Grain fields, often abundant and widely distributed in the state; nat. from the Old World. Var. PRAEMÓRSA (Lam.) Coss. & Dur. Sterile spikelets short-pediceled, the 4 outer much reduced, the apex deformed into knobs or variously incurved; fertile spikelet somewhat indurate, several-nerved at base, acuminate, the wing fin-like.—Waste places, San Diego Co. to the Sacramento Valley; the commoner form in Cal.; nat. from Eur.

2. **P. californica** H. & A. Culms erect or somewhat geniculate; blades flat, rather lax, 6 to 12 mm. wide; panicle 2.5 to 5 cm. long, 1.5 to 2 cm. thick, often purplish tinged; glumes about 6 to 7 mm. long, narrow, gradually narrowed from below the middle to an acute apex, the lateral nerves somewhat nearer the margin than the keel; fertile lemma ovate-lanceolate, about 4 mm. long, rather sparsely villous, often exposing the palea, the sterile lemmas about ½ as long.—Ravines and open moist ground, Coast Ranges from San Luis Obispo Co. to Mendocino Co.; n. to Ore.

3. **P. arundinàcea** L. REED CANARY GRASS. Culms erect, 6 to 15 dm. high; panicle 8 to 17 cm. long, narrow, the lower branches as much as 5 cm. long; glumes narrow, 4 mm. long, abruptly narrowed to an acute apex, the keel scabrous, not winged, the lateral nerves about midway between margin and keel; fertile lemma lanceolate, 3 mm. long, shining, sparsely villous; sterile lemmas villous, ⅓ as long.—Swamps and moist places, occasional: Lower San Joaquin; Siskiyou Co.; Modoc Co.; common throughout the n. parts of N. Am., Eur. and Asia. A form with variegated leaves is cult. under the name of Ribbon Grass.

4. **P. minor** Retz. Culms erect, 3 to 9 dm. high; panicle ovate-oblong to oblong, 1.5 to 5 cm. long; glumes oblong, 4 to 6 mm. long, broadened, strongly winged on the keel above, with a green stripe on each side of the keel at the base of the wing, the wing scabrous on the margin and more or less toothed; fertile lemma ovate, acute, villous, about 3 mm. long, the

sterile lemma solitary, about ⅓ as long.—Waste places, rather abundant: Sacramento Valley, s. to S. Cal.; nat. from Mediterranean region.

P. CANÀRIÉNSIS L., Canary Grass, with somewhat thicker panicles and larger spikelets with more conspicuously striped glumes and a pair of sterile lemmas about half as long as the fertile one, is sparingly escaped from cult., Yreka, San Diego, Pasadena, Berkeley, Monterey; native of Mediterranean region.

P. BRACHÝSTACHYS Link, resembling P. canariensis, but with smaller spikelets and a pair of minute sterile lemmas, has been found in waste ground at Nelson, Butte Co.; native of Mediterranean region.

5. **P. lémmoni** Vasey. Culms erect, 3 to 9 dm. high; panicle 5 to 10 cm. long; glumes about 5 mm. long, narrow, the lateral acuminate, dark-colored at maturity, villous except the acuminate tip, 3.5 mm. long; sterile lemmas less than ⅓ as long.—Localized: Sierra Nevada foothills (Butte Co. and Chinese Camp); South Coast Ranges; s. to S. Cal.

6. **P. caroliniàna** Walt. Culms erect, 3 to 6 dm. high; panicle oblong; glumes 5 to 6 mm. long, oblong, rather abruptly narrowed to an acute apex, the keel scabrous and narrowly winged above from below the middle, the lateral nerves about midway between keel and margin; fertile lemma ovate, acute, densely villous, about 4 mm. long.—Waste ground, rare, Mendocino and Ventura Cos.; native of se. U. S., apparently introduced on Pacific Coast.

7. **P. angústa** Nees. Culms 9 to 15 dm. high, smooth; blades flat, 6 to 8 mm. wide; panicle dense, linear-oblong, about 8 mm. thick; glumes about 4 mm. long, narrow, rounded at apex to a mucronate tip, scabrous on keel, nerves, and more or less on the back, especially near the apex, lateral nerves near the margin; fertile lemma ovate-lanceolate, acute, villous, 3 mm. long.—Open ground, at low altitudes: South Coast Ranges; upper San Joaquin Valley; cismontane S. Cal.; e. to La.

TRIBE 8. **Paníceae.** MILLET TRIBE

Spikelets with one perfect terminal floret and below this a sterile floret and two glumes; fertile lemma and palea indurate, or at least firmer than the glumes and sterile lemma; articulation below the spikelet.

63. **SYNTHERÍSMA** Walt.

Annuals or perennials with slender racemes digitate or aggregate at the summit of the culm. Spikelets lanceolate or elliptic, plano-convex, solitary or in 2s or 3s, subsessile or short-pediceled, alternate in two rows on one side of a 3-angled winged or wingless rachis. First glume minute or wanting; second glume equaling the sterile lemma or shorter. Fertile lemma cartilaginous, the hyaline margins pale. (Greek syn, with, and therismos, harvesting.) (Digitaria of authors, not Heist.)

120. Syntherisma sanguinalis Dulac; *a*, infl. x ½; *b*, *c*, spikelet (2 views) x 7.

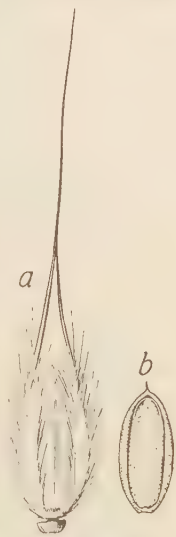
1. **S. sanguinàlis** (L.) Dulac. CRAB GRASS. Fig. 120. Annual, usually much-branched at base; culms 3 to 9 dm. high, geniculate-spreading, or creeping and rooting at the nodes, the flowering culms erect; sheaths more or less papillose-hirsute; blades lax, flat, 6 to 15 cm. long, 4 to 10 mm. wide, often pilose; racemes 3 to 12, subdigitate, 5 to 12 cm. long; spikelets in pairs, about 3 mm. long, usually appressed-pubescent between the nerves; pedicels angled; first glume minute; second glume about ½ as long as the spikelet.—Weed in cult. and waste ground, San Diego; throughout warm and temperate Am.; nat. from Eur.

64. **ERIÓCHLOA** H.B.K.

Annuals or perennials, with terminal panicles consisting of several to many racemes, along the main axis. Spikelets more or less

pubescent, solitary or sometimes in pairs, short-pediceled or subsessile, in two rows on one side of a narrow usually hairy rachis, the pedicels often clothed with long stiff hairs, the back of the fertile lemma turned from the rachis. Lower rachilla joint thickened, forming a more or less ringlike, usually dark-colored callus below the second glume, the first glume reduced to a minute sheath about this and adnate to it. Second glume and sterile lemma about equal, acute or acuminate. Fertile lemma indurate, minutely papillose-rugose, mucronate or awned, the awn often readily deciduous. (Greek erion, wool, and chloa, grass.)

1. **E. aristàta** Vasey. Fig. 121. Plants annual, branched at base; culms erect, sometimes decumbent at base, 3 to 9 dm. high; leaves glabrous, the blades flat, 4 to 10 mm. wide; racemes ascending or appressed, 2 to 3 cm. long, several to many on a pubescent axis 5 to 10 cm. long; spikelets approximate on a pubescent rachis, lanceolate, subulate-pointed, 6 to 8 mm. long, appressed-villous; fruit apiculate.—Moist open ground, lower Colorado River (Bard, Ft. Yuma); Ariz. to Mex.



121. Eriochloa aristata Vasey; *a*, spikelet; *b*, fertile floret. x 10.

65. PÁSPALUM L.

Ours perennials, with 2 to many spike-like racemes. Spikelets plano-convex, usually obtuse, subsessile, solitary or in pairs, in two rows on one side of a narrow or dilated rachis, the back of the fertile lemma toward it. First glume usually wanting; second glume and sterile lemma commonly about equal. Fertile lemma usually obtuse, chartaceous-indurate, the margins inrolled. (Paspalos, a Greek name for millet.)

1. **P. dístichum** L. Joint Grass. Culms erect from a decumbent rooting base, with numerous creeping rhizomes, 3 to 6 dm. high; sheaths glabrous or nearly so; blades flat, glabrous, rarely pubescent, 5 to 8 cm. long, the upper shorter; racemes 2, paired, slender, ascending or appressed, 2.5 to 6 cm. long, sometimes a third below the pair; spikelets elliptic, 3 mm. long; first glume commonly developed in one or more spikelets of a raceme, nearly as long as spikelet; second glume pubescent; sterile lemma glabrous. —Along the seacoast and interior irrigation ditches, Los Angeles, Merced, Crescent City; n. to the Columbia River; common near coasts throughout warmer parts of both hemispheres.

P. dilatàtum Poir., a tall perennial with elongate blades and panicles of 5 to 10 rather heavy spreading racemes on a slender axis, the flat overlapping spikelets 3 to 3.5 mm. long and with silky hairs around the margin; adv. near Los Angeles; native of S. Am.

P. larràñagai Arech., somewhat more robust than P. dilatatum, with conspicuously villous lower sheaths and denser panicles, the racemes ascending, the spikelets smaller and more hairy, has been found along irrigation ditches at Berry Creek, Butte Co. and at Palm Springs, Mt. San Jacinto; native of S. Am.

66. PÁNICUM L. Panic Grass

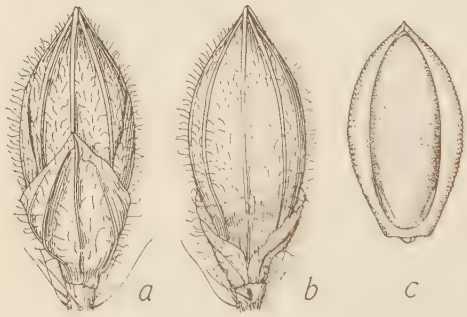
Annuals or perennials. Spikelets arranged in open or compact panicles, rarely racemes. Glumes usually very unequal, the first often minute, the second typically equaling the sterile lemma, the latter of the same texture and simulating a third glume, bearing in its axil a membranaceous or hyaline palea and sometimes a staminate flower, the palea rarely wanting. Fertile lemma chartaceous-indurate, typically obtuse, the nerves obsolete, the margins inrolled over an inclosed palea of the same texture. (Ancient Latin name for common millet.)

Plants annual.
Fruit transversely rugose ..... 1. *P. arizonicum.*
Fruit smooth.
Panicle drooping, heavy .. .. 5. *P. miliaceum.*

Panicle erect.
Panicle more than ½ the length of the entire plant.
Spikelets 2 to 2.5 mm. long.....2. *P. capillare.*
Spikelets 3 to 3.3 mm. long.....3. *P. barbipulvinatum.*
Panicle not more than ½ the entire height of plant; spikelets 2.8 to 3.3 mm. long.....4. *P. hirticaule.*
Plants perennial.
Spikelets 6 to 7 mm. long, pointed.....6. *P. urvilleanum.*
Spikelets less than 3.5 mm. long, obtuse.
Spikelets turgid, strongly nerved, sparsely hispid, 3.2 to 3.3 mm. long.....13. *P. scribnerianum.*
Spikelets not turgid or strongly nerved, pubescent, less than 3 mm. long.
Spikelets about 2.5 mm. long.....12. *P. shastense.*
Spikelets not over 2 mm. long.
Sheaths glabrous or nearly so.....7. *P. lindheimeri.*
Sheaths pubescent.
Plants velvety-pubescent throughout.....11. *P. thermale.*
Plants more or less pubescent but not velvety.
Vernal blades glabrous or nearly so above..9. *P. occidentale.*
Vernal blades pubescent above.
Upper surface of blades pilose; autumnal phase decumbent-spreading.....10. *P. pacificum.*
Upper surface of blades appressed-pubescent; autumnal phase erect or ascending.....8. *P. huachucae.*

A. Subgenus EUPANICUM Gren. & Godr. Annuals or perennials of various habit, but not forming winter rosettes of leaves different in appearance from the culm leaves, nor presenting distinct vernal and autumnal aspects.

1. **P. arizònicum** Scribn. & Merr. Fig. 122. Culms usually branching from the base, glabrous except below the panicle, 2 to 6 dm. high; nodes sometimes slightly pubescent; sheaths glabrous to strongly papillose-pubescent; blades 5 to 15 cm. long, 6 to 12 mm. wide, glabrous or papillose-hispid beneath; panicles long-exserted, finely pubescent and copiously papillose-hirsute, 7.5 to 22 cm. long, the branches solitary, ascending, few-flowered; spikelets 3.5 to 3.8 mm. long, obovate-elliptic, abruptly pointed, densely hirsute to glabrous, borne on very short appressed branchlets. — Open ground, Jamacha, San Diego Co.; e. to Tex., s. to Mex.



122. Panicum arizonicum Scribn. & Merr.; *a*, *b*, spikelet (2 views); *c*, fertile floret. x 10.

P. DICHÓTOMIFLÒRUM Michx., a smooth freely branching annual with numerous open many-flowered panicles of short-pedicelled spikelets, the first glume minute, broad and blunt, has been found in cult. soil at Fresno and southw.; native of e. U. S.

2. **P. capillàre** L. OLD-WITCH GRASS. Erect, 3 to 6 dm. high; foliage conspicuously papillose-hispid; blades 10 to 25 cm. long, 6 to 10 mm. wide; panicle large, diffuse, included at the base until maturity, the whole panicle finally breaking away and rolling before the wind; spikelets elliptic, abruptly-pointed.—Rare, Pinegrove, Amador Co.; a common weed in e. U. S.

3. **P. barbipúlvinàtum** Nash. Closely resembling no. 2, of which it is the western representative, but stouter, branching mostly from the base, with shorter less pubescent blades crowded toward the base, the spikelets about 3 mm. long.—Open ground and cultivated soil, lower altitudes throughout the state; B. C. to N. Dak. and Tex.

4. **P. hirticaúle** Presl. Erect or nearly so, 1.5 to 6 dm. high, more or less papillose-hispid throughout, especially on the sheaths; blades 4 to 12 mm. wide, often sparsely hispid toward the often cordate base; panicle open, the branches ascending; spikelets acuminate, usually reddish brown.—Open sandy ground, Jamacha, San Diego Co.; e. to Tex., s. to S. Am.

5. **P. miliàceum** L. Hog Millet. Broom-corn Millet. Plants coarse, as much as 9 dm. high, often depauperate; culms and leaves more or less papillose-hispid; panicle 10 to 30 cm. long, rather compact, the numerous branches ascending, spikelet-bearing toward the summit; spikelets 4.5 to 5 mm. long, ovate, acuminate, strongly many-nerved; first glume ½ the length of the spikelet, acuminate. — Sparingly escaped from cult., Kenwood, Sacramento, Riverside; native of Eur.

6. **P. urvílleànum** Kunth. Fig. 123. Plants robust, 6 to 9 dm. high, perennial from creeping rhizomes; culm solitary or few in a tuft, the nodes densely bearded but usually hidden by the harshly villous sheaths; blades 4 to 6 mm. wide, flat, tapering to a long involute-setaceous point; panicle about 30 cm. long, open; spikelets densely silvery or tawny-villous; first glume acuminate, ⅔ to nearly as long as spikelet.—Sandy deserts, Mohave and Colorado deserts; e. to southern Ariz.; also Chile and Argentina.

123. Panicum urvilleanum Kunth; *a*, habit x ⅓; *b*, *c*, *d*, spikelet (3 views) x 3; *e*, staminate floret x 3; *f*, fertile floret (2 views) x 3.

B. Subgenus Dichanthelium Hitchc. & Chase. Tufted perennials, producing winter rosettes of leaves different in shape from the culm leaves; vernal culms slender, simple, bearing small open comparatively few-flowered terminal panicles; autumnal culms repeatedly branched, with numerous reduced branchlets, reduced leaves and partly included cleistogamous panicles.

7. **P. lindheìmeri** Nash. Vernal culms stiffly ascending or spreading, 3 to 6 dm. high, glabrous, or the lower part somewhat pubescent; blades ciliate on the margin toward the base; ligule a ring of hairs 4 to 5 mm. long; panicle 4 to 8 cm. long, open; spikelets about 1.5 mm. long, obovate, obtuse, turgid, pubescent; autumnal culms stiffly spreading or radiate-prostrate, with tufts of short appressed branches at the nodes; blades involute-pointed, often conspicuously ciliate at base.— Open mostly moist ground, rare: Sacramento; Three Rivers; throughout mid. and e. U. S.

8. **P. huachùcae** Ashe. Vernal phase usually stiffly upright, more or less harsh-pubescent throughout; culms 3 to 6 dm. high, the nodes bearded; ligule of stiff hairs about 4 mm. long; panicle 5 to 8 cm. long, the axis and usually the branches pilose; spikelets 1.6 to 1.8 mm. long, obovate, pubescent; autumnal phase stiffly erect, the branches fascicled, the crowed blades ascending.—Open ground, rare, San Bernardino Mts.; chiefly in the Mississippi Valley.

9. **P. occidentàle** Scribn. Vernal phase yellowish green; culms slender, 1.5 to 3 dm. high, spreading, sparsely pubescent; leaves mostly at the base; sheaths sparsely pubescent; ligule ciliate, about 4 mm. long; blades appressed-pubescent beneath; panicle 5 to 8 cm. long, open; spikelets 1.8 mm. long;

autumnal phase branching from the lower nodes, forming a spreading tussock.—Peat bogs and moist sandy soil, scattered stations at low or middle altitudes: San Diego; Sierra Nevada; North Coast Ranges; n. to B. C.

10. **P. pacíficum** Hitchc. & Chase. Vernal phase light green, more or less papillose-pilose throughout, 3 to 6 dm. high; ligule ciliate, about 4 mm. long; spikelets 1.8 to 2 mm. long; autumnal phase prostrate-spreading, repeatedly branching from the upper and middle nodes.—Sandy shores and slopes, and moist crevices in rocks: San Bernardino Mts. and Sierra Nevada, 500 to 4000 ft.; along the coast from Pt. Reyes to Del Norte Co.; n. to B. C. The commonest species of the genus in Cal. Distinguished from no. 9 by the more copious pubescence, more leafy culms, and, in the autumnal phase, by the branching habit.

11. **P. thermàle** Boland. Vernal phase grayish green, densely tufted, 1 to 3 dm. high; culms ascending or spreading; nodes bearded; ligule ciliate, about 3 mm. long; blades thick, mostly about 5 cm. long; spikelets about 2 mm. long; autumnal phase widely spreading, repeatedly branching, forming a dense cushion.—Wet saline soil, mostly in vicinity of hot springs: Sonoma Co.; Lassen Peak; n. to B. C. and the Yellowstone.

12. **P. shasténse** Scribn. & Merr. Vernal phase 3 to 4.5 dm. high; papillose-pilose throughout; ligule sparsely ciliate, 3 mm. long; spikelets papillose-pubescent; autumnal phase spreading, with geniculate nodes and elongate arched internodes, rather sparingly branching from the middle nodes.—Meadows, Castle Crag, upper Sacramento River (the only known locality).

13. **P. scríbneriânum** Nash. Vernal phase erect, 3 to 6 dm. high; sheaths papillose-hispid; ligule ciliate, about 1 mm. long; blades 5 to 8 cm. long, 6 to 12 mm. wide, firm, rounded and ciliate at base, glabrous above, often pubescent beneath; panicles 5 to 8 cm. long; spikelets blunt, sparsely hispid or nearly glabrous; autumnal phase branching from the middle and upper nodes, the branches longer than the internodes, late in the season producing crowded branchlets with ascending, not greatly reduced blades and small, partly included panicles from their upper nodes.—Meadows, Castle Crag, upper Sacramento River; e. to Me.; common in the Mississippi Valley.

67. ECHINÓCHLOA Beauv.

Coarse, often succulent, our species annual with compressed sheaths, linear flat blades, and rather compact panicles of short densely flowered racemes along a main axis. Spikelets plano-convex, often stiffly hispid, subsessile, solitary or in irregular clusters on one side of the panicle branches. First glume about half the length of the spikelet, pointed; second glume and sterile lemma equal, pointed, mucronate, or the glume short-awned and the lemma long-awned, sometimes conspicuously so, inclosing a membranaceous palea and sometimes a staminate flower. Fertile lemma plano-convex, smooth and shining, acuminate-pointed, the margins inrolled below, flat above, the apex of the palea not inclosed. (Greek echinos, hedgehog, and chloa, grass.)

124. Echinochloa crusgalli Beauv.; habit x ⅓.

Sterile and fertile lemmas awn-tipped or long awned..... 1. *E. crusgalli.*
Sterile and fertile lemmas scarcely mucronate..... 2. *E. colonum.*

1. **E. crusgálli** (L.) Beauv. Water Grass. Fig. 124. Culms stout, branching from the base or erect, usually 6 to 9 dm. high, sometimes larger; leaves glabrous; panicle dense, 10 to 25 cm. long, consisting of several erect spreading or even drooping racemes; spikelets green or purple, long-awned or nearly awnless, about 3 mm. long, exclusive of awns, densely and irregularly

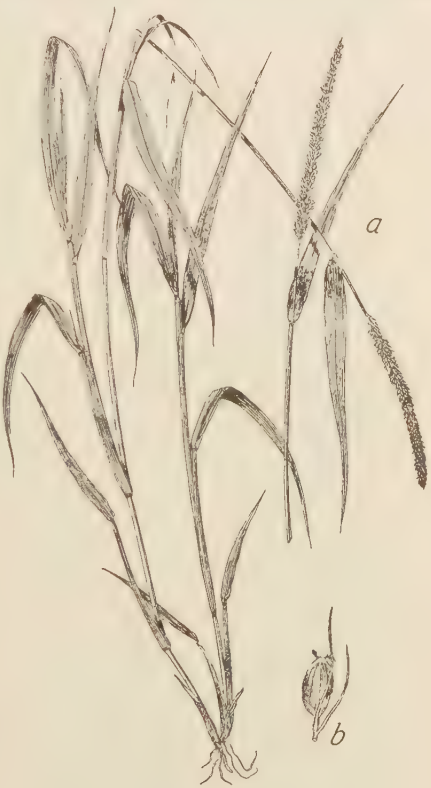
crowded in 3 or 4 rows.—Fields and cult. soil, especially along irrigating ditches; serious pest in the Sacramento Valley rice-fields; nat. from Eur. Var. ZELAYÉNSIS (H.B.K.) Hitchc. An erect pale short-awned form with short ascending racemes.—Open, often alkaline soil, mostly along irrigating ditches, Imperial Co.; e. to Tex., s. to Mex.

2. **E. colònum** (L.) Link. Culms erect, spreading or prostrate, 3 to 6 dm. high; leaves smooth; panicle of 5 to 10 dense racemes, 1.5 to 2.5 cm. long, rather distant, racemose, erect or nearly so; spikelets about 3 mm. long; glumes and sterile lemma pubescent.—Occasional in moist places in S. Cal.; introd. from the Old World into the warmer parts of Am.

68. CHAETÓCHLOA Scribn. FOXTAIL MILLET

Annuals or perennials with narrow usually dense and spike-like panicles. Spikelets subtended by one to several bristles (sterile branchlets), falling free from the bristles. First glume broad, usually less than half the length of the spikelet, 3 to 5-nerved; second glume and sterile lemma equal, or the glume shorter, several-nerved. Fertile lemma coriaceous indurate, smooth or rugose. (Greek chaete, bristle, and chloa, grass.) (Setaria Beauv.)

Plants annual.
Bristles backwardly barbed..... 1. *C. verticillata.*
Bristles forwardly barbed.
Bristles below each spikelet 5 or more..... 3. *C. lutescens.*
Bristles below each spikelet 1 to 3...2. *C. viridis.*
Plants perennial by short rhizomes or knotty crown. 4. *C. geniculata.*



125. Chaetochloa verticillata Scribn.; *a*, habit x ½; *b*, branchlet with spikelet and bristles x 4.

1. **C. vérticillàta** (L.) Scribn. Fig. 125. Culms 3 to 6 dm. high; blades scabrous; panicles usually green, 5 to 10 cm. long, somewhat lobed or interrupted at base, tapering above; bristles 4 to 6 mm. long; spikelets 2 to 2.5 mm. long.—Waste ground, S. Cal. (Upland), rare; nat. from Eur.

126. Chaetochloa lutescens Stuntz; infl. x ½.

2. **C. víridis** (L.) Scribn. GREEN FOXTAIL. Culms 3 to 6 dm. high; blades flat, not twisted; panicle green, oblong-ovate, 2.5 to 8 cm. long; bristles 1 to 3, slender, 6 to 12 mm. long; spikelets 2 mm. long; fruit faintly wrinkled.—Waste ground, rare, San Bernardino Valley; nat. from Eur.

3. **C. lutéscens** (Weig.) Stuntz. YELLOW FOXTAIL. PIGEON GRASS. Fig. 126. Culms branching at the base, compressed, erect or ascending, 3 to 6 dm. high; blades flat, with a spiral twist; panicle yellowish, cylindric, dense, 2.5 to 8 cm. long; bristles 5 or more, 4 to 8 mm. long; spikelets 3 mm. long;

fruit cross-wrinkled.—Weed in fields and waste places, somewhat rare: Sacramento; Fresno; Three Rivers; Los Angeles; Riverside; nat. from Eur. (Setaria glauca of authors.)

4. **C. géniculàta** (Lam.) Millsp. & Chase. Culms erect, 9 to 12 dm. high; blades 4 to 6 mm. wide, flat or folded; panicle slender, linear, 5 to 10 cm. long, 5 to 6 mm. thick; bristles 5 to 8, twice as long as spikelet, pale or tawny; spikelets 2 mm. long; fruit cross-wrinkled.—Open ground, rare: Fresno; Los Angeles; Pomona; Riverside; e. to southern U. S., s. to Argentina. (Setaria gracilis H.B.K.)

69. PENNISÈTUM Rich.

Ours perennial with dense thick panicles. Spikelets solitary or in groups of 2 or 3, surrounded by an involucre of bristles, these not united except at the very base, often plumose, falling attached to the spikelets. First glume shorter than the spikelet, sometimes minute or wanting; second glume shorter than or equaling the sterile lemma. Fertile lemma chartaceous, smooth, the margin thin, inclosing the palea. (Latin penna, feather, and seta, bristle.)

127. Cenchrus pauciflorus Benth.; habit x ½.

1. **P. villòsum** R. Br. Culms geniculate, 3 to 6 dm. high, with dense soft feathery terminal spike-like panicles 2.5 to 8 cm. long; bristles of the involucre slender, plumose, about 2.5 cm. long.—Cult. for ornament; escaped in hills near Santa Barbara and Ventura; native of Abyssinia.

70. CÉNCHRUS L.

Our species annual with flat blades and racemes of readily deciduous burs. Spikelets solitary or few together, surrounded and inclosed by a spiny bur composed of numerous coalescing bristles (sterile branchlets), the bur globular, the peduncle short and thick, articulate at base, falling with the spikelets and permanently inclosing them, the seed germinating within the old involucre. (Greek kegchros, millet.)

1. **C. pauciflòrus** Benth. SANDBUR. Fig. 127. Culms flattened, much branched, ascending or spreading, 3 to 6 dm. high; blades flat; burs 8 to 20, spiny, the body 4 to 6 mm. thick; spikelets 2 to 3 in each bur.—Sandy soil, nearly across the continent; rare in Cal. but spreading; Mecca; Redlands; San Bernardino; betw. Ontario and Colton; Kerman; Fresno. (C. caroliniana of authors.)

TRIBE 9. **Andropogòneae**. SORGHUM TRIBE

Spikelets in pairs along a rachis, the usual arrangement being one of the pair sessile and fertile, the other pedicellate and staminate or neuter, or rarely wanting, only the pedicel present; fertile spikelet consisting of one perfect terminal floret and below this, a staminate or neuter floret, the lemmas thin or hyaline, and two awnless glumes, usually one or both firm or indurate.

71. IMPERÀTA Cyr.

Slender erect perennials with narrow silky panicles. Spikelets all alike, awnless, in pairs, unequally pedicellate on a slender continuous rachis, surrounded by long silky hairs. Glumes about equal, membranaceous. (Ferrante Imperate, Italian naturalist.)

128. Imperata hookeri Rupr.: *a*, panicle x ⅓; *b*, rachis and pedicels x 5; *c*, spikelet x 5.

129. Andropogon saccharoides Sw.; *a*, habit x ½; *b*, fertile spikelet displayed x 2½; *c*, pair of spikelets x 2½.

usually bearing a bent and twisted awn from the apex or from between the lobes. Palea small or wanting. Pedicellate spikelet reduced. (Greek aner, man, and pogon, beard.)

Inflorescence a flabellate panicle of numerous racemes, sessile on the main axis..... 1. *A. saccharoides.*

Inflorescence of numerous compound branches, the racemes in pairs subtended by spathes..... 2. *A. glomeratus.*

1. **A. sáccharoìdes** Sw. Fig. 129. Culms tufted, erect or somewhat spreading at base, 6 to 12 dm. high, glabrous except the densely ascending-hispid nodes; sheaths glabrous; blades 3 to 6 mm. wide, flat, scabrous above, the upper much reduced; panicle 5 to 8 cm. long, silky-white; glumes of sessile spikelet 5 mm. long, the awn about 1 cm. long, bent at the middle, tightly twisted below.—Dry hills, Santa Barbara to San Diego; e. to Tex. and W. I., s. to S. Am. (A. barbinodis Lag.)

2. **A. glomeràtus** (Walt.) B.S.P. Fig. 130. Culms stout, erect, wand-like, 6 to 9 dm. high; sheaths compressed, usually sparsely villous; inflor-

1. **I. hóokeri** Rupr. Fig. 128. Culms erect from creeping rhizomes, 9 to 15 dm. high, glabrous; sheaths glabrous; blades elongate, the lower narrowed at the long conduplicate base, 8 to 12 mm. wide, acuminate, glabrous, the uppermost much reduced; panicle 15 to 30 cm. long, pale, tawny, or somewhat rose-tinted; spikelets about 3 mm. long, the hairs twice as long.—Death Valley to the Colorado Desert; e. to N. Mex., s. to Mex.

72. ANDROPÒGON L. Beard Grass

Our species perennials with solid culms, the spikelets in racemes, these numerous, aggregate on a common axis, or single, in pairs, or sometimes in 3s or 4s, the common peduncle usually inclosed by a spathe-like sheath, these sheaths often numerous, forming a compound inflorescence. Rachis readily disarticulating, the joints and the pedicels of the sterile spikelets often villous. Glumes of the fertile spikelet coriaceous, narrow, the first rounded, flat, or concave on the back, several-nerved, the median nerve weak or wanting. Fertile lemma

130. Andropogon glomeratus B.S.P.; *a*, habit x ⅛; *b*, joint of raceme x 3; *c*, glumes x 6; *d*, sterile lemma x 6; *e*, fertile lemma x 6.

escence oblong or corymbose, ½ to ⅓ the entire height of the plant; spathes scabrous; racemes 2 to 3 cm. long, the slender joints of the rachis clothed with long silky hairs; awns delicate, straight.—Rocky slopes, San Bernardino foothills to the Funeral Mts.; e. to Mass. and Fla.

73. HÓLCUS L.

Annuals or perennials with flat blades and terminal panicles of 1 to 5 jointed tardily disarticulating racemes. Pedicellate spikelets usually staminate, the terminal joint with two pedicellate spikelets. (Old Latin name for a grass, probably from Greek holcos, attractive.) (Sorghum Pers.)

131. Holcus halepensis L.; *a*, rhizome and panicle x ⅓; *b*, pair of spikelets x 5.

1. **H. halepénsis L.** JOHNSON GRASS. Fig. 131. An erect glabrous robust perennial with extensively creeping rhizomes; culms 6 to 12 dm. high; blades flat, 6 to 18 mm. wide, the midrib prominent, white; panicle 15 to 25 cm. long, open; fertile spikelets about 5 mm. long, the glumes pubescent, becoming glabrate and shining; fertile lemma with a bent readily deciduous awn; staminate spikelets narrow, 4 mm. long, on pedicels about 3 mm. long, the glumes membranaceous, nerved, glabrous.—Occasional from Santa Barbara to San Diego Co. along the coast; introd. from the Old World. A valuable forage grass but often becoming an aggressive weed. (Andropogon halepensis Brot.) The Sudan Grass of cultivation is Holcus sorghum var. sudanensis (Piper) Hitchc.; rootstocks none; branches few; midribs not white.

CYPERÀCEAE. SEDGE FAMILY

Grass-like or rush-like herbs with fibrous roots, annuals, or many species perennial by long rootstocks. Stems solid (rarely hollow), usually triangular or terete, commonly scape-like with mostly basal leaves. Leaves alternate, narrow, with closed sheaths, often 3-ranked. Flowers one in the axil of each bract (scale), borne in spikelets or spikes arranged in clusters, heads, racemes, panicles or umbels. Perianth none or represented by usually 4 to 6 bristles. Stamens 1 to 3. Pistil 1; ovary 1-celled with 1 ovule, the single style with 2 or 3 stigmas. Fruit a lenticular or 3-angled achene. Embryo minute in mealy endosperm.

Flowers all, or at least some of them, perfect.
- Flowers all perfect; spikelets many flowered, with 1 or 2 of the lower scales empty.—SCIRPEAE.
  - Spikelets flattened, the scales in 2 opposite ranks.
    - Inflorescence terminal, involucrate; flowers without bristles; achene beakless. . . . . 1. CYPERUS.
    - Inflorescence axillary; flowers with bristles; achene beaked. . . . . 2. DULICHIUM.
  - Spikelets cylindrical (or sometimes a little flattened in no. 5) the scales imbricated around the axis in several rows.
    - Style enlarged or bulbous at base.
      - Bulbous base of style persistent on the achene; perianth bristles generally present; spikelet solitary, terminating the naked stem, the leaves at base reduced to sheaths. . . . . 3. ELEOCHARIS.
      - Bulbous base of style deciduous, not persistent on achene; perianth bristles none; spikelets umbellate or capitate, the stems leafy at base. . . . . 4. FIMBRISTYLIS.
    - Style not enlarged at base.
      - Scales not enclosing a bractlet; perianth bristles usually present.
        - Perianth bristles 1 to 8, barbed or none; stamens mostly 3; spikelets solitary or clustered or in a compound umbel; stem often leafy at base and inflorescence involucrate; perennials except 2 species. . . . . 5. SCIRPUS.
        - Perianth bristles numerous, naked, long-exserted and silky in fruit; stamens 1 to 3; spikelets few, otherwise as in Scirpus; perennials. . . . . 6. ERIOPHORUM.

Scales enclosing a minute bractlet; bristles none; annuals..... 7. Hemicarpha.
Flowers of 2 kinds, perfect and staminate; spikelets few (1 or 2, sometimes to 6)-flowered, with 3 to several of the lower scales empty.—Rynchosporeae.
Scales 2-ranked; style wholly deciduous.....8. Schoenus.
Scales spirally imbricated.
Style wholly deciduous; perianth bristles none.....9. Cladium.
Style or its base persistent as a tubercle or beak on the achene; perianth bristles commonly present.....10. Rynchospora.
Flowers unisexual; spikes many-flowered, the lower scales not empty; achene enclosed in a sac (perigynium) or spathe.—Cariceae.....11. Carex.

1. **CYPÈRUS** L. Galingale

Annuals or perennials. Stems triangular or terete, never branched, leafy at base. Inflorescence subtended by a conspicuous leafy involucre, umbellate with unequal rays and a sessile central spike, or capitate. Flowers in flattened or subterete spikelets, the spikelets in capitate clusters or arranged in spikes borne on the rays. Scales concave, more or less carinate, 2-ranked. Perianth none. (Greek Kupeiros, the ancient name.)

Style 2-cleft; achene lenticular or at least not triangular; spikelets flat; scales falling from the rachis; rachis not winged; stems with a single simple cluster of spikelets.
Spikelets in a close terminal cluster; scales sharply carinate; achene lenticular.
Achene oblong; stamens 2; scales obtuse, 1 line long.....1. *C. melanostachyus.*
Achene ovoid; stamens 3; scales acute, 2 lines long.....2. *C. bromoides.*
Spikelets in an apparently lateral cluster; stamens 3; scales scarcely carinate; achene plano-convex .....3. *C. laevigatus.*
Style 3-cleft; achene 3-angled; inflorescence compound, the clusters of spikelets borne on rays, or sometimes congested and capitate.
Spikelets flattened; scales falling away from the rachis which is persistent on the spike.
Rachis naked or nearly so, the scales not decurrent upon it; stamen 1.
Scales not toothed on back; low or dwarf annuals.
Scales 7 to 9-nerved, with strongly recurved setaceous tips..... 4. *C. aristatus.*
Scales obscurely 3-nerved, with short recurved tips...5. *C. acuminatus.*
Scales minutely toothed on back at apex, obtuse or merely acute, without recurved tips; tall perennial.....6. *C. virens.*
Rachis with the scales decurrent upon it as narrow scarious wings; stamens 3.
Wings of the rachis soon separating to the base; annual.
Wings persistent on the rachis.....7. *C. erythrorhizos.*
Wings readily deciduous.....8. *C. sphacelatus.*
Wings of the rachis persistent; perennial by means of tuber-bearing rootstocks.....9. *C. esculentus.*
Spikelets not so strongly flattened, deciduous from (but the 2 lowest scales persistent on) the spike; scales decurrent on the rachis as wings; wings broad, scarious, wholly adnate to rachis; stamens 3.
Perennials with basal tuber-like corms; spikelets falling whole; wings not enclosing achenes.....10. *C. strigosus.*
Annuals; spikelets breaking up into 1-fruited joints; wings very broad, enclosing achenes.
Spikes oblong, compact.....11. *C. speciosus.*
Spikes short, loose and spreading.....12. *C. ferax.*

1. **C. mélanostàchyus** H.B.K. Annual; stems very slender, triangular, ¾ to 1 ft. high; leaves elongate-tapering, 1 line wide or less; involucral bracts 2 or 3, foliaceous, narrowly linear, ½ to 3½ in. long; spikelets oblong, 3 to 6 lines long, in a small capitate cluster; scales chestnut-brown, keeled, 3-nerved on back, very obtuse, 1 line long; achene lenticular, sharply beaked.—Rivers and valleys, widely scattered, not common, 20 to 2000 ft.; s. to Mex. and Argentina.

2. **C. bròmoides** Link. Annual; stems slender, 1 to 1⅔ ft. high, exceeding the few rough-margined leaves; spikelets 4 to 9 lines long; involucral leaves 2 to 4, the longest 4 to 5½ in. long; scales acute, yellow-brown, about 2 lines long, the keel 3-nerved and the margins scarious; achene ovoid, black, ⅓ as long as scale.—Los Angeles Co.; Mex. and tropical regions of the Americas.

3. **C. laevigàtus** L. Perennial, the stems arising at intervals from a wiry rootstock; stems subterete, slender, 3 to 10 in. high, hardly surpassing the erect filiform leaves; spikelets 2 to 5, 2 to 4 lines long, in a sessile apparently lateral cluster; involucre of usually 2 bracts, one long (1 to 2 in.) and erect, in continuation of stem, the other short (3 or 4 lines long) or wanting; rachis deeply pitted transversely; scales orbicular, 3-nerved in middle, a brown blotch on each side, closely imbricated, ¾ line long; achene oblong, gray,

½ as long as scale.—Along streams in wet sand: cismontane S. Cal.; Colorado Desert; Death Valley; s. to Mex.; all continents.

4. **C. aristàtus** Rottb. Dwarf annual; stems ½ to 6 in. high, barely exceeding the leaves; leaves flat, ½ line or less wide; involucral bracts foliaceous, ½ to 2 in. long; spikelets linear-oblong, 1½ to 3 lines long, in a dense compound head or in close clusters on 2 or 3 short (¼ to 1 in. long) rays; rachis not winged; scales 7 to 9-nerved, with strongly recurved setaceous tips, chestnut-brown or greenish, ⅔ to 1 line long; achene 3-angled.—Widely scattered, valleys, mts. and deserts, 500 to 4000 ft., but not common; n. to B. C., e. to the Atlantic; S. Am., Afr., Asia, Austr.

5. **C. acuminàtus** Torr. & Hook. Annual; stems slender, tufted, 5 to 12 in. high; leaves commonly less than 1 line wide; bracts of the involucre 2 or 3, much elongated; spikelets 3 or 4 lines long, capitate on the rays or the whole inflorescence congested and head-like; scales oblong, obscurely 3-nerved, with a short recurved tip; achene 3-angled, about ½ as long as scale.—S. Sierra Nevada in Tulare Co. (rare); n. to Wash.; Ariz. to La. and Ill.

6. **C. vìrens** Michx. Perennial; stems acutely triangular, 1 to 3 ft. high; involucral bracts 4 to 6, very long and leafy, broad and strongly keeled; umbel compound, or the spikes capitate on the rays, or the whole often much reduced and subcapitate; spikelets numerous, many-flowered, long-oblong, 4 to 8 lines long; scales concave-carinate, serrulate on back at apex, 1 line long; achene 3-angled.—Cismontane, 20 to 5000 ft., widely scattered; e. to N. C. and s. to Cent. Am.

7. **C. erỳthrorhìzos** Muhl. Annual; stems 1 to 1½ ft. high, stout, triangular; leaves flat or conduplicate, 6 to 14 in. long, 2 to 3 lines wide; involucral bracts 6 to 8, foliaceous, 4 to 12 in. long; rays 1½ in. long or less, bearing umbels of spikes which are ½ to 1 in. long; bracts of involucels shorter, foliaceous; spikelets usually 2 to 3 lines long, narrowly linear, somewhat crowded, horizontally spreading, nearly flat, bright chestnut-color; rachis clothed with the persistent wings of the scales; scales elliptical, obtuse, mucronulate, ⅔ line long; keel smooth; achene 3-angled.—Clear Lake; Sacramento and San Joaquin rivers; e. to the Atlantic.

8. **C. sphacelàtus** Rottb. Annual, similar in habit to no. 9; stems tufted, slender, 4 to 10 in. high; leaves 1 to 2½ lines wide, shorter than the stems; spikelets numerous, densely short-spicate, linear, 1 line wide; rachis at length wingless, the narrow wings early deciduous; scales oblong-lanceolate, purple-green, several nerved, 1 line long; achenes nearly black, 3-angled, ½ as long as scale.—S. Cal.; Mex., trop. Am.

C. rotúndus L. Nut-grass. Perennial; stems ½ to 1 ft. high; rootstock slender, scaly, bearing tubers; umbel compound or nearly simple; spikelets few, clustered on the ends of the unequal rays; scales closely appressed; achene linear, 3-angled, ½ as long as the scale.—Introd. weed in cult. lands or orchards: San Joaquin Valley; Upland; Colton; Riverside; e. U. S., trop. Am., Eur.

9. **C. esculéntus** L. Chufa. Rush-nut. Perennial, with slender rootstocks bearing small globose tubers; stems triangular, ½ to 1 ft. high; spikes in an umbel subtended by foliaceous bracts 7 in. long or less; spikelets chestnut-brown, linear, 4 to 8 in. long, the joints of the rachis with a narrow wing on each side subtending the achene; scales ovate, obtuse, 3 or 4 nerves each side of the keel, 1½ lines long; achene black, 3-angled.—Infrequent but widely scattered in Cal.; e. to the Atlantic; all continents. Var. heermánnii Britt. Spikes clustered at summit of rays and involucellate; spikelets sometimes bracteate.—Kern River.

10. **C. strigòsus** L. Perennial; stems 1 to 1½ ft. high; spikes dense, ½ to 1 in. long, on rays 5 in. long or less, in a more or less compound umbel, the foliaceous involucral bracts 2 to 10 in. long; spikes with the lowest scales persistent on rachis after fall of spikelet from spike; spikelets linear, 6 to 9-flowered, 4 to 9 lines long, the slender joints with a scarious wing embracing

one margin of the achene; scales slender ovate, 2 (or 3) callous striae on each side the keel, 2 lines long; achene oblong, 3-angled.—Mariposa Co.; Tex. to Fla. and Me.

11. **C. speciòsus** Vahl. Annual; stems stout, 1 ft. high; umbel compound or simple, subtended by several foliaceous bracts 5 to 13 in. long; rays 1 to 2 in. long; spikelets linear-lanceolate, 3 to 6 lines long, spreading at mostly right angles to the spike, the very short joints of its rachis winged with very broad scarious margins which inclose the 3-angled achene; scales ovate, overlapping, with a round green back and scarious rusty red sides, 1½ lines long. —Visalia; coastal S. Cal.; e. to the Atlantic; trop. regs.

12. **C. fèrax** Rich. Annual, closely related to C. speciosus, but leaves shorter, broader and with smoother margins; scales more rigid; spikelets stouter.—Coastal S. Cal.; e. to Mo.; trop. Am.

2. DULÍCHIUM Pers.

Perennial herb with terete hollow jointed stems, leafy to the top. Leaves linear, short, flat, 3-ranked. Spikes axillary, peduncled. Spikelets linear, flattened, sessile in 2 ranks. Scales lanceolate, decurrent as wing-like margins on the joints below. Perianth-bristles 6 to 9, downwardly barbed. Stamens 3. Style 2-cleft above. Achene linear-oblong, flattened, beaked with the long persistent style. (Etymology uncertain.)

1. **D. arundinaceum** (L.) Britt. Plants 1 to 3 ft. high—Muddy borders of peaty ponds: e. Fresno Co.; Humboldt Co.; n. to B. C., e. to the Atlantic.

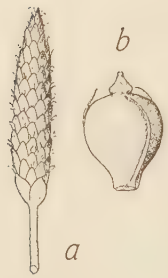
3. ELEÒCHARIS R. Br. Spike-Rush

Annuals or chiefly perennials. Stems tufted, simple, terminating in a solitary spikelet not subtended by an involucre. Leaves reduced to sheaths or the lowest rarely blade-bearing. Spikelets several to many-flowered. Scales concave. Stamens 2 or 3. Perianth-bristles 3 to 9, commonly retrorsely barbed. Style 3-cleft and achene 3-angled, or 2-cleft and achene lenticular; base of the style enlarged and persistent as a tubercle on the summit of the achene. (Greek elos, marsh, and charis, delight.)

Style mostly 2-cleft; achene lenticular or biconvex.
  Achene jet-black; tubercle depressed; annual ..... 1. *E. capitata.*
  Achene light-brown.
    Perennial; tubercle conical, less than half as broad as the body of the achene; spikelet lanceolate ..... 2. *E. palustris.*
    Annual; tubercle thin, deltoid, as broad or nearly as broad as the achene; spikelet ovate.
      Bristles often nearly twice as long as the achene ..... 3. *E. obtusa.*
      Bristles ¼ to ½ as long as the achene ..... 4. *E. monticola.*
Style 3-cleft; achene turgid or 3-angled; perennial.
  Tubercle reduced to a mere scar or very obscure ..... 5. *E. bolanderi.*
  Tubercle well-developed and more or less prominent.
    Achene with several longitudinal ridges connected by a transverse lattice-work; spikelet flattened ..... 6. *E. acicularis.*
    Achene smooth.
      Stems erect or nearly so, not rooting at tip; tubercle constricted at base or at least sharply defined from the achene.
        Spikelet lanceolate; scales acute ..... 7. *E. parishii.*
        Spikelet oblong; scales obtuse ..... 8. *E. montana.*
      Stems or some of them bending over and rooting at tip; tubercle subulate or narrowly pyramidal, continuous with the achene ..... 9. *E. rostellata.*

1. **E. capitàta** R. Br. Stems erect, tufted, 7 to 8 in. high; spikelet ovate, 1¼ to 2 lines long; bristles 6 (or 7), about as long as the achene; stamens 2 or 3; achene black and shining, lenticular; tubercle white, thin and a little like a skull-cap.—Wet sandy soil, S. Cal.; e. U. S.; Asia, Afr., Aust.

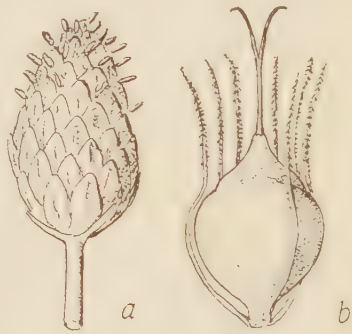
2. **E. palústris** R. & S. Common Spike-rush. Wire-grass. Fig. 132. Stems ½ to 2 ft. high, stoutish, mostly terete, sheathed at the base, leafless, creeping, stoloniferous; sheaths sub-truncate; rootstock stout; spikelet many-flowered, 6 to 14 lines long; bracts ovate-oblong to oblong-lanceolate; scales ovate-oblong, purplish brown with scarious margin; bristles 3, rather shorter



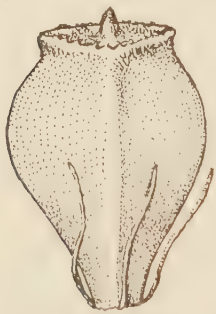
132. Eleocharis palustris R. & S.; *a*, spikelet x 1; *b*, achene x 8.

than the achene; style 2-cleft; achene obovoid, biconvex; tubercle deltoid, constricted at the point of junction.—Ponds, marshes and shallow slow-moving creeks, at low altitudes in Cal.; n. to B. C., e. to the Atlantic; Eur., Asia. Var. GLAUCESCENS Gray. Tubercle narrower, sometimes half as long as the achene.—Mts. of S. Cal.

3. **E. obtùsa** Schult. Fig. 133. Stems tufted, numerous, erect, nearly terete, striate, 7 to 10 (16) in. high; annual with fibrous roots; spikes oblong-ovate to broadly ovate, 2 to 4 lines long; scales ovate to sub-orbicular, rounded at apex; bristles 6 to 9, mostly longer, sometimes nearly twice longer than the achene; achene smooth, shining, obovoid with a narrow base, somewhat flattened or biconvex with cord-like or thickened margins, the broad summit bearing a very thin deltoid acutish tubercle, in outline something like a cocked hat.—Moist places or in shallow water, Sierra Nevada and North Coast Ranges; n. to Ore.; Atlantic States.



133. Eleocharis obtusa Schult.; *a*, spikelet x 4; *b*, achene and bristles x 13.



134. Eleocharis bolanderi Gray; nutlet and bristles x 28.

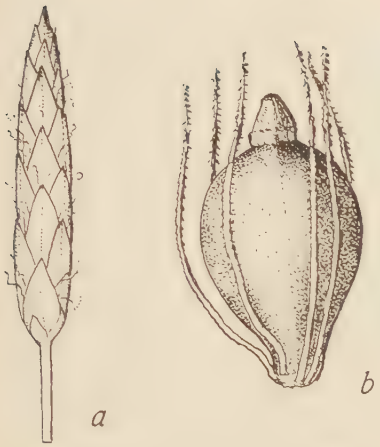
4. **E. montícola** Fer. Resembling E. obtusa; stems 4 to 10 in. high; spikes ovate-lanceolate, 3 to 4½ lines long; scales acutish, more spreading. — N. Sierra Nevada; n. to Ore. and Ida.

5. **E. bolánderi** Gray. Fig. 134. Stems tufted, 8 to 9 in. high, arising from rootstocks; spikes dark-colored, narrow-ovate, 2½ to 3 lines long; bristles 3 or 4, about ¼ to ½ (or ⅗) as long as the achene; achene obovoid, triangular with cord-like ridges at the angles; tubercle reduced to a flatish scar, very short and broad or somewhat obscure.—Central Sierra Nevada, 6000 to 7000 ft.

6. **E. ácicularis** R. & S. SLENDER SPIKE-RUSH. Fig. 135. Stems tufted, ½ to 1½ (or 8) in. high, filiform or setaceous; rootstock very slender, creeping; spikelets a little flattened, 1 to 3 lines long, few-flowered; achene obovoid-oblong, ½ line long, obscurely triangular, with 9 or 10 longitudinal ribs connected by fine transverse lines; tubercle broad, short and blunt. — Moist places throughout Cal., but not reported from the deserts; all continents.

135. Eleocharis acicularis R. & S.; *a*, entire plant x 1; *b*, spikelet x 5; *c*, bract x 18; *d*, achene x 18.

7. **E. paríshii** Britt. Fig. 136. Stems 4 to 7 in. high, strongly striated, arising from a slender rootstock; spikes slender-lanceolate, 3 to 7 lines long, dark chestnut-color; bristles 6 (or 7), ciliate, exceeding or sometimes rather shorter than the achene; achene nearly plane on one side, convex and somewhat keeled on the other; tubercle narrow, short, somewhat like a fool's cap.—Valley and mountain marshes throughout Cal.



136. Eleocharis parishii Britt.; *a*, spikelet x 4; *b*, achene and bristles x 21.

broadened at base.—S. Cal; Mendocino Co.; Tuolumne Co.; e. to Col., s. to S. Am.

9. **E. rostellàta** Torr. WALKING-SEDGE. Fig. 138. Stems from a short caudex, 1 to 2½ ft. high, the sterile ones bending over and rooting at the apex; spikelet oblong, 3 to 5-flowered; scales light-brown or straw-color; bristles 6, exceeding the achene; achene obovoid, obtusely triangular; tubercle stoutly subulate or narrowly pyramidal, half or nearly half as long as the achene.—Marshy meadows: coastal S. Cal.; Colorado and Mohave deserts. Mostly throughout N. Am. Var. CONGDÒNII Jepson. Bristles equaling the achene; tubercle barely ⅓ as long as the achene.—San Francisco.

138. *a*, Eleocharis rostellata Torr., achene and bristles x 7. *b*, Var. congdonii Jepson x 7.

8. **E. montàna** R. & S. Fig. 137. Stems 10 to 14 in. high from stoutish rootstocks; spikelets narrowly oblong, 2½ to 5 lines long; scales straw-color or light-brown; bristles 5 or 6, exceeding or a little shorter than the achene; achene obovoid, flattish on one side, strongly convex on the other; tubercle conical,

137. Eleocharis montana R. & S.; *a*, spikelet x 4; *b*, achene and bristles x 21.

4. FIMBRÍSTYLIS Vahl

Annuals or perennials. Stems leafy below. Spikelets umbellate or capitate, terete, subtended by a 1 to many-leaved involucre. Scales spirally imbricated all around, mostly deciduous. Perianth bristles none. Stamens 1 to 3. Style 2 to 3-cleft, its base swollen, and commonly tuberculate, the whole falling away from the achene at maturity. Achene lenticular or 3-angled. (Latin fimbriae, fringe, and stylus, style.)

Achene triangular; tubercle more or less persistent; style glabrous; annual..... 1. *F. capillaris.*

Achene flattened or biconvex; tubercle deciduous.
Spikelets clustered; style glabrous, at least below; annual.....2. *F. vahlii.*
Spikelets umbellate, solitary on the rays or in the forks; style ciliate; perennial..... 3. *F. thermalis.*

1. **F. capillàris** Gray. Fig. 139. Stems tufted, somewhat bristle-like, 2 to 7 in. high, much exceeding the filiform leaves, and bearing 1 to 3 spikelets, when 3 the stem shortly forked at apex and bearing 1 spikelet in the fork; spikelets narrowly ovate, 1½ to 2½ lines long; involucral bract lanceolate-setaceous; achene obovoid, triangular, lightly wrinkled transversely, the angles somewhat thickened; tubercle small, deltoid, more or less persistent. —Yosemite.

139. Fimbristylis capillaris Gray; *a*, entire plant x 1; *b*, spikelet x 2; *c*, scale x 12; *d*, achene x 12.

at base. Spikelets terete or somewhat flattened, solitary or in heads, spikes or umbels, subtended by an involucre of 1 to several leaves or the involucre wanting. Perianth bristles 1 to 6, barbed or ciliate or smooth, or none. Stamens 2 or 3. Style 2 or 3-cleft, not swollen at the base, deciduous or its base persistent on the achene. Achene triangular, lenticular or plano-convex. (Latin scirpus, bulrush.)

2. **F. váhlii** Link. Fig. 140. Stems slender, densely tufted, 1 to 4 in. high, longer than or equaling the filiform leaves; spikelets in clusters, subtended by filiform elongated upright bracts which exceed the cluster 4 to 6 times; achene minute, transversely reticulate. — Clear Lake; Visalia; Ft. Yuma. Se. U. S.; S. Am.

3. **F. thermàlis** Wats. Fig. 141. Stems 1 to 2 ft. high, bearing few to many spikelets in a simple or compound umbellate cluster; leaves ½ to ⅔ as tall as the stems; spikelets oblong-ovate, 4 to 5 (or 7) lines long; style hairy; achene whitish, broadly obovoid, flattened, the tubercle linear, nearly as long, soon deciduous. — Margins of hot springs: Arrowhead Sprs., San Bernardino; Owens Valley. Nev.

5. **SCÍRPUS** L. Club-Rush. Bulrush

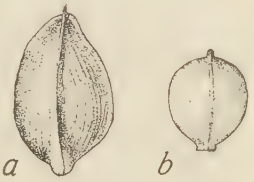
Perennials or annuals. Stems leafy or the leaves reduced to mere sheaths

140. Fimbristylis vahlii Link; *a*, entire plant x 1; *b*, spikelet x 2; *c*, bractlet x 10; *d*, achene x 15.

Spikelets solitary and terminal; stems low, slender.—Subgenus ISOLEPIS.
Annual; involucral bract present.
Scales obtuse or merely acute....1. *S. cernuus.*
Scales acute, shortly beaked, strongly keeled....2. *S. carinatus.*
Perennial; involucral bract none....3. *S. pauciflorus.*
Spikelets in clusters; perennial.—Subgenus EUSCIRPUS.
Stems low; achene longitudinally ribbed and horizontally striate....4. *S. setaceus.*
Stems tall; achene not longitudinally ribbed.
Bristles retrorsely barbed or ciliate, rarely wanting.
Stems terete or nearly so; spikelets congested or umbellate.
Stems leafy at base; spikelets in a sessile cluster....5. *S. nevadensis.*
Stems leafless; spikelets in an umbellate or congested cluster.
Bristles barbed.
Achene 1 line long, nearly equaling the scale; umbels mostly long-rayed; very rare....6. *S. validus.*
Achene (1 or) 1¼ to 1½ lines long, ¼ to ½ shorter than the scale; umbels capitate or of a few short rays; very common....7. *S. acutus.*
Bristles plumose; umbels long-rayed....8. *S. californicus.*
Stems 3-angled.
Stems with a single head or compact umbel, leafy below or the leaves mainly basal.
Involucral bract solitary; spikelets densely capitate-clustered, the inflorescence apparently lateral.
Stems very slender, leafy below; scales awn-tipped....9. *S. americanus.*
Stems stout, leafless or mostly so; scales truncate or obtuse, quite awnless or with a minute point..10. *S. olneyi.*
Involucral leaves several, foliaceous; inflorescence terminal, the spikelets capitate, or in an umbel with unequal mostly short rays; leaves mainly basal.
Awn of scale glabrous, smooth; achene plano-convex....11. *S. campestris.*
Awn of scale minutely scabrid; achene as if trigonous, in reality flat on one face, carinate-convex on the other....12. *S. fluviatilis.*
Stems bearing a panicle of irregular umbels, leafy to the top.
Pedicels or raylets erect or spreading, bearing few to several sessile spikelets.
Achenes rounded on the back; bristles 4...13. *S. microcarpus.*
Achenes angled on the back; bristles 6.....14. *S. congdonii.*
Pedicels drooping, bearing a single spikelet.....15. *S. lineatus.*
Bristles with the barbs pointed upward; mature heads conspicuously hairy on account of the elongated bristles....16. *S. criniger.*

141. Fimbristylis thermalis Wats.; *a*, cluster of spikelets x 1; *b*, scale x 5; *c*, achene x 5.

1. **S. cérnuus** Vahl. Fig. 142. SLENDER CLUB-RUSH. Stems tufted, filiform or setaceous, 2 to 9 in. high, sheathed at base, the uppermost sheath often bearing a short slender blade; involucral bract 1 to 3 lines long or almost none; spikelet solitary, oblong-ovate, 1 to 1½ or 2 lines long; scales round-ovate, concave, obtuse or merely acute, lineate - carinate; style 3-cleft; achene brown, ⅓ line long, obovoid, flattish on one side, convex-rounded and with a fine median ridge on the other, finely or somewhat obscurely papillate, apiculate.—Springy or marshy places near the coast, San Bernardino Valley to Humboldt Co.; n. to Ore. All continents.

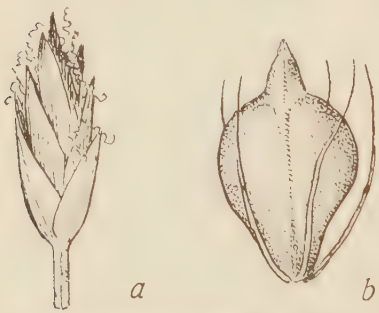


142. Scirpus cernuus Vahl; *a*, scale; *b*, achene. x 12.

S. CAESPITÒSUS L. Stems naked; spikelet solitary; involucral bract present; bristles longer than the achene. —Rae Lake, Kings River (S. clementis Jones). S. YOSEMITANUS Smiley. Stems leafy; bristles shorter than the achene (ex char.). —Tuolumne Mdws.

2. **S. carinàtus** Gray. DWARF CLUB-RUSH. Fig. 143. Stems tufted, slender, triangular, 1 to 2 in. high, shortly leaved at base; involucral bract 4 to 9 lines long; spikelet solitary, ovate, 1½ to 2 or 3 lines long; scales strongly keeled, acute, 2 to 3-nerved on the sides, the midrib excurrent as a short beak; achene strongly triangular, globose in outline, light-brown, ¾ line long, obscurely short-necked at base. — Swamps and low spots near the coast: Mendocino Co. to San Diego Co.

143. Scirpus carinatus Gray; *a*, entire plant x 1; *b*, *c*, scale, dorsal and ventral views x 12; *d*, achene x 12.

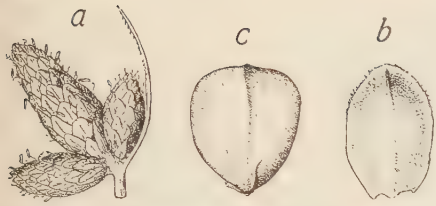


144. Scirpus pauciflorus Lightf.; *a*, spikelet x 5; *b*, achene and bristles x 16.

3. **S. pauciflòrus** Lightf. Fig. 144. Stems striate, 3-angled, leafless, slightly tufted, very slender (2½ to 4½ in. high), from slender rootstocks; spikelet solitary, terminal, 2 to 3 lines long, without involucral bracts, few (about 3)-flowered; scales narrow-ovate, obtusish; bristles 2 to 6, as long as the achene or longer; stamens 3; style 3-cleft; achene obovoid-oblong, rather strongly beaked.—San Jacinto Mts. to the S. Sierra Nevada. Ore. to B. C., e. to Me. Eur., Asia.

4. **S. setàceus** L. Fig. 145. Stems caespitose, 4 to 5 in. high, twice as high as the leaves, the horizontal rootstocks very slender; involucral bracts 2 to 4 lines long; spikelets 1 or 2 in a place, narrow-ovate, 1½ lines long; scales more or less dark brown with a broad green midvein; achenes elliptic-obovoid, ½ line long, flattish on one side, convex and somewhat angled on the other, longitudinally and rather regularly ribbed, finely and horizontally striate between the ribs, apiculate.—Moist places, Humboldt Co. Eur., Asia, Afr., Austr.

145. Scirpus setaceus L.; *a*, cluster of spikelets x 3; *b*, achene x 27.

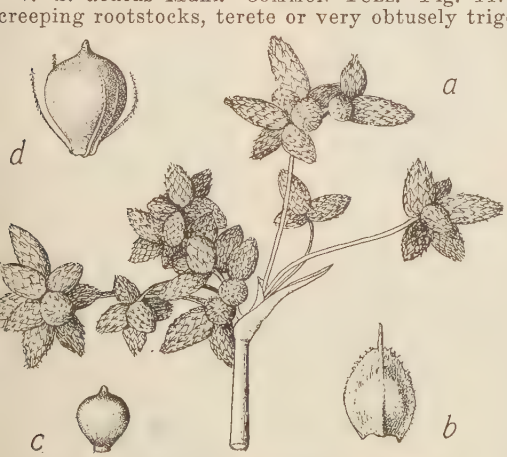


146. Scirpus nevadensis Wats.; *a*, cluster of spikelets x 1; *b*, scale x 4; *c*, nutlet x 4.

5. **S. nevadénsis** Wats. Fig. 146. Stems clustered from a creeping rootstock, 9 to 18 in. high; leaves ½ to ⅔ height of the stems, ⅛ to ⅔ line wide, channeled, involute; spikelets chestnut-brown, oblong-ovate, 4 to 10 lines long, 3 or 4 (‘‘ to 8’’) in a terminal sessile cluster; involucral bract narrowly linear or acicular, ½ to 1¼ in. long; scales ovate, obtusish, not awned; achenes nearly circular or round-ovate, flat on one face, rounded or hemispheric on the other; bristles 1 to 3, less than half the length of the achene.—Moist alkaline lands, east of the Sierra Nevada; Nev. to Wash.

6. **S. válidus** Vahl. Great Bulrush. Stems 3 to 8 ft. high from stout scaly rootstocks; basal sheaths soft, the hyaline margins soon lacerate; spikelets narrow-ovate, in clusters of 1 to 5, borne on the rays of a lax panicle; scales equaling or but little longer than the achene, roundish, ciliate, mucronate; bristles 4 or usually 5 or 6, retrorsely barbed, shorter than or usually slightly longer than the achene; style 2-cleft; achene broadly obovoid, plano-convex, apiculate.—Known only at a few scattered stations in Cal.: Santa Ana River; Russian River; Siskiyou Co. Widely distributed in N. Am.

7. **S. acùtus** Muhl. Common Tule. Fig. 147. Stems arising from stout creeping rootstocks, terete or very obtusely trigonous above, 3 to 9 ft. high, leafless or with a short terete leaf from the upper basal sheath; inflorescence apparently lateral, 1 to 5 in. long; involucral bract stout, shorter than the inflorescence; spikelets 3 to 6 lines long, numerous, congested capitate, or in an irregular umbel with unequal rays; scales ovate, ciliate, shortly awned, ¼ to ⅓ longer than the achene; bristles 6, slender, retrorsely barbellate, slightly shorter than or about equaling the achene; style 2-cleft; achene lenticular, gray, abruptly mucronate. —Salt and freshwater marshes and borders of lakes and streams, very common: Cal. to B. C., Newf. and Ariz. It is our estimate that originally there were in California about 250,000 acres of tule lands; much of this area has now been reclaimed to cultivation. Tule stems were used by the native tribes to build their balsas or small boats and to weave mats. At the present day the stems are used for packing nursery stock for shipment, thatching hay-stacks, and as a source of potash.



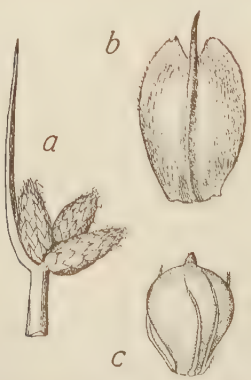
147. Scirpus acutus Muhl.; *a*, panicle of spikelets x 1; *b*, scale x 4; *c*, achene x 4; *d*, achene and bristles x 7.

8. **S. californícus** Britt. California Bulrush. Fig. 148. Similar to S. acutus; umbel irregular, looser, its rays more slender, up to 4 in. long; spikelets dark reddish brown, cylindric or narrow-ovate, (3 or) 4 to 5 lines long; scales short-aristate; bristles 2, 3 or 4, ribbon-shaped, dark red, conspicuously short-hairy or somewhat plumose.—Marshes throughout Cal.; e. to Fla.; S. Am.

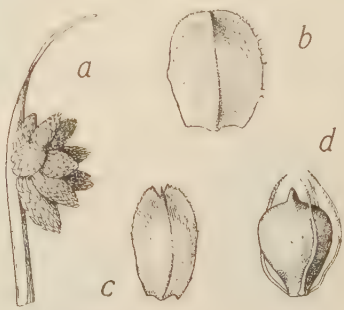
148. Scirpus californicus Britt.; *a*, cluster of spikelets x 1; *b*, scale x 10; *c*, achene and bristles x 10.

9. **S. americânus** Pers. THREE SQUARE. Fig. 149. Stems ¾ to 2 ft. high, very slender, triangular, somewhat leafy; leaves short, the blade 1 to 3 or 7½ in. long; involucral bract solitary, pungent, 1 to 4 in. long; spikelets 1 to 6, oblong-ovate, 3 to 7 lines long, borne in a single crowded sessile cluster; scales dark brown, usually conspicuously tipped with a stout pale-colored awn about a line long; achene flat on one face, convex on the other and somewhat obscurely keeled; bristles 2 to 6, very unequal, the longer about as long as the achene.—Marshy often brackish places, occasional throughout Cal.; N. Am., Chile.

10. **S. ólneyi** Gray. OLNEY BULRUSH. Fig. 150. Stems from the bulbous nodes of running rootstocks, 2 to 5 ft. high or more, stout, triquetrous, sheathed at base, leafless or with a single very short leaf; involucral bract 1 to 1¼ in. long; spikelets 2 to 26 in a single crowded sessile cluster, oblong-ovate, 2 to 5 lines long; scales brown, elliptic, membranous, obtuse, glabrous or slightly ciliate; style 2-cleft; achene obovate, flattish on one side, convexish on the other, beaked, smooth.—Common in brackish marshes. East to the Atlantic.



149. Scirpus americanus Pers.; *a*, cluster of spikelets x 1; *b*, scale x 5; *c*, achene and bristles x 5.



150. Scirpus olneyi Gray; *a*, cluster of spikelets x 1; *b*, scale (lower) x 5; *c*, scale (upper) from a different plant x 5; *d*, achene and bristles x 5.

151. Scirpus campestris Britt.; *a*, cluster of spikelets x 1; *b*, scale x 3; *c*, achene x 3; *d*, achene and bristles x 3.

11. **S. campéstris** Britt. BULL TULE. Fig. 151. Stems 1 to 3 ft. high, stout, acutely triangular, the point of junction with the slender rootstock often enlarged into hard woody tubers; leaves equaling or exceeding the stem, keeled, flat or deeply channeled, 2 to 4 lines wide; involucre of few unequal spreading foliaceous bracts 3 to 13 in. long, one much the longer and more erect; inflorescence terminal, the spikelets in clusters of 1 to 3, the clusters congested-capitate or commonly somewhat umbellate with unequal rays; rays ¼ to 1½ in. long; spikelets ovate or oblong-ovate, acute, 6 to 10 lines long; scales thinly scarious, obscurely puberulent or subglabrous, keeled, bifid or lacerate, with a short soon recurved subulate awn between the teeth; bristles 2 to 6, minutely and retrorsely scabrous, shorter than the achene; style 2-cleft; achene round-obovate, sublenticular, obtuse or truncatish, slightly apiculate, dark brown, shining.—Salt marshes and moist alkaline soils: throughout Cal.; n. to Ore., e. to N. J.

12. **S. fluviátilis** Gray. Fig. 152. Similar to S. campestris; bract of the inflorescence exceedingly elongated; scales minutely puberulent, the subulate awn recurved; bristles exceeding the achene; achene brownish or drab, narrow-obovoid, flattish on one face, strongly carinate-keeled on the other, obscurely apiculate, shortly attenuate at base.—Borders of lakes and streams: Sutter Co.; Honey Lake; e. to N. J.

152. Scirpus fluviatilis Gray; achene and bristles x 6.

13. **S. microcárpus** Presl. PANICLED BULRUSH. Fig. 153. Stems from stout creeping rootstocks, stout, triangular, leafy, 2 to 5 ft. high; leaves flat, 4 to 8 lines wide; margins scabrid; involucre of several spreading foliaceous bracts, about 1 to 2 times as long as the inflorescence; spikelets 1 to 5 in terminal and axillary clusters, the clusters in an umbellate compound panicle; panicle large and open, the rays 1 to 6 in. long, the raylets ¼ to ¾ in. long; spikelets narrow-ovate, greenish or lead-colored, 1 to 2½ lines long; scales ovate, membranous, with broad green midrib; bristles 4, barbed to the base; stamens 2; style 2-cleft; achene pale, plano-convex, not angled on the back, abruptly short-beaked, ½ line long.—Common along streams and in fresh-water marshes: throughout Cal.; n. to Alas., e. to Newf.

14. **S. congdònii** Britt. Similar to S. microcarpus, but panicle less diffuse, its rays 3 to 6, 2 to 3½ in. long; spikelets densely capitate at the ends of the rays; style 3-cleft; bristles rather longer than the achene; achene oblong-obovate, flat on one face, angled on the back.—Fresno Co. and Plumas Co. in the Sierra Nevada.

15. **S. lineàtus** Michx. Stems slender, triangular, from a stout rootstock, densely leafy at base, less leafy above, 1½ to 3 ft. high; leaves flat, 3 to 6 lines wide, scabrous-margined; panicle of umbels compound, 2 to 5 in. long, the spikelets mostly solitary at the ends of the raylets, the very slender rays becoming pendulous; involucral bracts much shorter than the inflorescence; spikelets reddish brown, short-cylindric, (2 or) 4 to 6 lines long; scales ovate or oblong, short-awned, membranous with a green midvein; bristles 6, weak, entangled, smooth, equaling or exceeding the scales; stamens 3; style 3-cleft; achene obovoid, flat on one face; convex-ridged on the other, short-beaked, ½ line long.—Dry hills, Siskiyou Co. Ore. to the Atlantic.

153. Scirpus microcarpus Presl; *a*, panicle x ½; *b*, spikelet x 6; *c*, scale x 9; *d*, achene and bristles x 9.

16. **S. crìniger** Gray. Fig. 154. Stems ¾ to 3 ft. high, triangular and striate; leaves 1½ to 4 in. long, 1½ to 2½ lines wide; spikelets 9 to 18, 5 to 7 lines long, congested in a sessile head; filaments slender, much exserted and exceeding the 6 very long bristles; style 3-cleft; achene oblong, sulcate-triangular, shortly beaked, 1 line long. — High mountains, 7000 to 8000 ft., Sierra Nevada, n. to Siskiyou Co., thence s. to Mendocino Co. Also sw. Ore.

6. ERIÓPHORUM L.

COTTON-SEDGE

Bog perennials with triangular or nearly terete stems from creeping rootstocks. Leaves linear or the uppermost reduced to sheaths. Spikelets terminal on a leafy or naked stem, solitary or clustered or umbellate, subtended by an involucre of leaf-like bracts or none. Scales membranous, 1 to 5-nerved. Perianth-bristles numerous, filiform, silky-white, becoming greatly elongated in fruit. Stamens 1 to 3. Style very slender and elongated, 3-cleft. Achene triangular. (Greek erion, wool, phoros, bearing, referring to the woolly heads.)

154. Scirpus criniger Gray; *a*, head of flowers x 1; *b*, achene and bristles x 3.

155. Eriophorum gracile Koch var. caurianum Fer.; cluster of spikelets in fruit x 1.

1. **E. grácile** Koch. SLENDER COTTON-SEDGE. Stems subterete, weak and very slender, 1 to 2 ft. high, with one or more erect, very narrow, triangular-channeled leaves; involucre of a single erect colored bract much shorter than the inflorescence; rays 4 to 6 lines long, slightly nodding, roughish-puberulent; spikelets 2 to 5, oblong, 3 to 4 lines long; scales lead-color or blackish; perianth bristles 6 to 7 lines long in fruit.—Cold swamps, San Francisco and Sonoma Co. northward. Boreal regions around the earth. Var. CAURIÀNUM Fer. Fig. 155. Scales straw-color or brownish.—Northern Sierra Nevada and n.

156. Hemicarpha micrantha Pax; *a*, entire plant x 1; *b*, spikelet x 7; *c*, scale x 18; *d*, achene x 18.

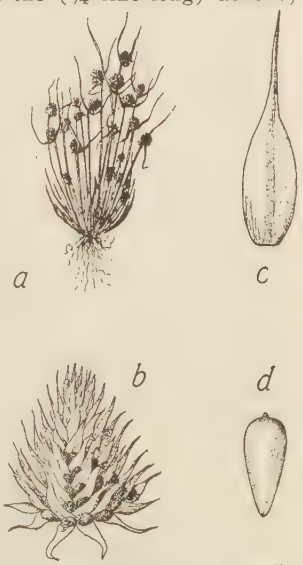
7. HEMICÁRPHA Nees & Arn.

Dwarf tufted annuals, with almost filiform stems and leaves. Spikelets small, terminal, terete, solitary or clustered, subtended by a 1 to 3-leaved involucre. Scales enclosing a minute hyaline bractlet between the flower and the axis of the spikelet. Perianth none. Stamen 1. Style 2-cleft. Achene subterete. (Greek hemi, half, and karphos, chaff, in reference to the inner bractlet.)

Scales spreading only at the tip or erect, little exceeding the achenes....1. *H. micrantha.*
Scales spreading, 2 to 3 times as long as the achenes.....2. *H. occidentalis.*

1. **H. micrántha** (Vahl) Pax. Fig. 156. Stems ¾ to 1¼ in. high, sheathed at base with 1 or 2 short filiform leaves; involucral bract ½ to 6 lines long; spikelets 1 to 3, ovate, reddish-brown, 1 to 1½ lines long; scales cuneate-obovate, short-acuminate and slightly spreading at the tip or erect, little longer than the (¼ line long) achene; bractlet adherent to the achene.—San Diego Co. and Sierra Nevada foothills; Wash. e. to the Atlantic; S. Am. Var. ARISTULÀTA Cov. Stems 4 to 8 in. high; spikelets conspicuously squarrose by reason of the abruptly attenuate scales; achene black.—Great Plains region; also Wash. and Cal.

2. **H. óccidentàlis** Gray. Fig. 157. Similar; stems 1 to 2 in. high; spikelets greenish, broadly ovate; scale ¾ to 1 line long, its body oblong or lanceolate, 3 or 4-nerved, abruptly tapering into a spreading awn-like tip 1 to 1½ times as long; bractlet not adherent to the achene; achene brownish, narrow-obovoid, somewhat flattened. —Middle altitudes: cismontane S. Cal.; Sierra Nevada. N. to Wash.



157. Hemicarpha occidentalis Gray; *a*, habit x 1; *b*, spikelet x 8; *c*, scale x 18; *d*, achene x 18.

8. SCHOÈNUS L.

Mostly perennials with rush-like tufted rigid stems. Leaves semi-terete, basal, the sheaths dark-colored. Spikelets 1 to 6-flowered, aggregated in a terminal cluster. Scales in 2 ranks, the lower ones empty, the upper with perfect or pistillate flowers, the uppermost with staminate flowers or empty. Perianth of 3 to 6 plumose or smooth bristles or none. Stamens usually 3. Style-branches 3. Achene 3-angled, without a tubercle. (Greek schoinos, a rush.)

158. Schoenus nigricans L.; *a*, cluster of spikelets x 1; *b*, achene x 5.

1. **S. nígricans** L. Black Galingale. Fig. 158. Perennial; stems 10 to 20 in. high, surpassing the erect rigid pungent leaves; heads 5 to 7 lines high, dark chestnut-color; spikelets flattened; bristles naked in our form; achene white.—Alkaline soil: Lone Pine Cañon, Cajon Pass; Arrowhead Sprs.; Death Valley; Nev., Tex., Fla., Eur., Afr., Asia.

9. CLÀDIUM P. Br. Saw-Grass

Very tall leafy perennials. Stems terete (in ours), from stout rootstocks. Leaves much elongated, serrate on the margin and folded on the midrib so as to be channeled above. Spikelets small, few-flowered, borne in terminal and lateral compound panicles and consisting of several loosely imbricated scales; lower scale empty, the middle one or two bearing staminate flowers, the upper one usually perfect and fertile. Stamens in ours 2. Style 2 or 3-cleft, deciduous. Achene ovoid or globose, without tuberele. (Diminutive of Greek klados, a branch, referring to the branched inflorescence.)

1. **C. maríscus** R. Br. Stems numerous, stout, 6 to 10 ft. high, forming very dense and heavy hummocks; leaves 4 to 7 ft. long, 4 to 5 lines broad; panicles diffuse, drooping, the lateral ones 4 to 8 in number, from the axils of short sheathing leaves; spikelets narrowly oblong, 2 lines long, in clusters of 2 or 3; achene brown, cylindric-ovate, 1 to 1¼ lines long.—Moist ground: s. bases San Gabriel and San Bernardino mountains; Inyo Co. S. Nev. All continents.

10. RYNCHÓSPORA Vahl

Chiefly perennials with erect more or less leafy and triangular stems from rootstocks. Spikelets ovate, globular, or fusiform, variously clustered; scales plane or a little concave, not keeled, the uppermost subtending imperfect flowers. Perianth of 1 to 20 bristles. Stamens commonly 3 (in ours usually 2.) Style 2-cleft. Achene lenticular or globular, crowned by the persistent base of the style. (Greek ryncos, snout, and spora, seed.)

1. **R. álba** Vahl. White-beak Rush. Perennial; stems almost filiform, ½ to 2 ft. high; leaves narrowly linear or almost bristle-like; spikelets disposed in a head-like terminal corymb (and usually 1 or 2 lateral ones), white or whitish, becoming tawny with age, perfecting only a single flower; bristles 9 to 12 (or 20); tubercle flattened, triangular-subulate, nearly as long as the achene.—Bogs, Mendocino Co. N. Am., Eur., Asia.

11. CÀREX L. Sedge

By K. K. Mackenzie

Grass-like sedges, perennial by rootstocks. Culms (stems) mostly triangular, often strongly phyllopodic (leafy at base) or aphyllopodic (not leafy at base). Leaves 3-ranked, the upper (bracts) elongate or short, and subtending the spikes of flowers or wanting. Flowers monoecious or sometimes dioecious. Spikes 1 to many, either wholly pistillate, wholly staminate, androgynous or gynaecandrous, sessile or peduncled, the base of the peduncle often with a perigynium-like or spathe-like organ (clado-prophyllum) surrounding it. Perianth none. Stamens 3 (or rarely 2). Achene 3-angled, lenticular or plano-convex, completely enclosed by the sac-like perigynium. (The Latin name.)

A. Spike one, androgynous, bractless; perigynia glabrous, beaked, the beak with closed suture at apex dorsally.

Achenes triangular; stigmas 3, rarely 2.
Pistillate scales persistent; perigynia inflated, sessile, not becoming reflexed..... 1. Inflatae.
Pistillate scales deciduous; perigynia not inflated, stipitate, at least the lower reflexed at maturity..... 2. Athrochlaenae.
Achenes lenticular; stigmas 2..... 3. Capitatae.

B. Spikes one to many; if one, not as in A.

1. *Achenes lenticular and stigmas 2; lateral spikes sessile; terminal spike partly pistillate, or if staminate the lateral spikes short or heads dioecious.*

Perigynia not white-puncticulate.
Rootstocks long-creeping, the culms arising singly or few together; perigynia with beak obliquely cut, at most bidentulate.
Spikes densely aggregated into a globose or ovoid head, appearing like one spike. 4. FOETIDAE.
Spikes, at least the lower, distinct. 5. DIVISAE.
Cespitose or rootstocks short-creeping; perigynia with beak obliquely cut to deeply bidentate.
Spikes androgynous (i. e., staminate flowers uppermost).
Perigynia abruptly contracted into the beak.
Spikes few (usually 10 or less); perigynia green or tinged with reddish-brown. 6. MUHLENBERGIANAE.
Spikes numerous; perigynia yellowish or brownish at flowering.
Perigynia yellowish; opaque part of leaf-sheath usually transversely rugulose. 7. MULTIFLORAE.
Perigynia brownish; opaque part of leaf-sheath not transversely rugulose. 8. PANICULATAE.
Perigynia tapering into the beak. 9. STENORHYNCHAE.
Spikes gynaecandrous (i. e., pistillate flowers uppermost).
Perigynia at most thin-edged.
Perigynia spreading or ascending at maturity. 10. STELLULATAE.
Perigynia appressed. 11. DEWEYANAE.
Perigynia narrowly to broadly wing-margined. 12. OVALES.
Perigynia white-puncticulate. 13. CANESCENTES.

2. *Achenes triangular and stigmas 3, or lenticular and stigmas 2; if lenticular, lower lateral spikes conspicuously peduncled, or terminal spike staminate and lateral spikes elongated.*

Staminate and pistillate spikes on different culms; stigmas 3, short. 17. SCIRPINAE.
Staminate and pistillate spikes on the same culms.
Spike solitary.
Perigynia many-nerved, rounded and beakless at apex; stigmas 3, short. 14. POLYTRICHOIDEAE.
Perigynia 2-keeled, not rounded at apex, beakless or beaked.
Perigynia glabrous; stigmas 3, elongated. 15. FIRMICULMES.
Perigynia pubescent or puberulent; stigmas 3. 16. FILIFOLIAE.
Spikes more than one.
Perigynia closely enveloping the achene, strongly tapering at base, pubescent or puberulent; bracts sheathless or nearly so; stigmas normally 3, long. 18. MONTANAE.
Perigynia not as above; or if so, at least the lowest bract strongly sheathing.
Bracts (at least lowest) long-sheathing, more or less purplish-tinged, the blades absent or rudimentary; stigmas 3, early deciduous. 19. DIGITATAE.
Lowest bract sheathless or long-sheathing; if long-sheathing its blade well-developed.
Lowest bract strongly sheathing; perigynia never strongly bidentate with stiff teeth.
Achenes lenticular; stigmas 2. 20. BICOLORES.
Achenes triangular; stigmas 3.
Scales greenish or light reddish-brown or purplish-tinged.
Rootstocks long-creeping; scales purplish-tinged. 21. PANICEAE.
Rootstocks not long-creeping; scales greenish to reddish-brown tinged.
Perigynia glabrous or hispidulous; leaves not pubescent.
Pistillate spikes erect on stiff peduncles. 22. LAXIFLORAE.
Pistillate spikes slender on slender peduncles, the lower drooping. 24. DEBILES.
Perigynia or leaves or both strongly pubescent. 23. TRIQUETRAE.
Scales dark reddish-brown to blackish tinged. 25. FRIGIDAE.
Lowest bract sheathless or sheathing; if sheathing, perigynia strongly bidentate with stiff teeth.
Perigynia or leaves or both pubescent; stigmas 3. 31. HIRTAE.
Neither perigynia nor leaves pubescent.
Style jointed with the achene, deciduous.
Achenes triangular; stigmas 3.
Lowest bract sheathless.
Pistillate spikes narrowly cylindric, elongated; perigynia not bidentate. 26. ANOMALAE.
Pistillate spikes ovoid, oblong or linear; perigynia bidentate or entire. 27. ATRATAE.

Lowest bract sheathing; perigynia bidentate.....
32. EXTENSAE.

Achenes lenticular; stigmas 2.
Achenes constricted in the middle; scales sharp-pointed, three-nerved..29. CRYPTOCARPAE.
Achenes not constricted in the middle..28. ACUTAE.
Style persistent, continuous with the achene.
Perigynia nerveless, except for the marginal nerves; stigmas 3.....30. TRACHYCHLAENAE.
Perigynia several to many-nerved.
Perigynia coarsely ribbed; stigmas 3 or 2.....
33. PHYSOCARPAE.
Perigynia finely and closely ribbed; stigmas 3....
34. PSEUDO-CYPEREAE.

1. Inflatae.

Pistillate scales 1-nerved; perigynia ovoid, inflated, tapering at apex; staminate part of spike scarcely conspicuous; achenes 1.25 to 1.5 mm. long.....1. *C. engelmannii.*
Pistillate scales 3-nerved; perigynia broadly ovoid, strongly inflated, abruptly minutely-beaked; staminate part of spike conspicuous; achenes 2 mm. long..2. *C. breweri.*

2. Athrochlaenae.

Represented by one species in our range.....3. *C. nigricans.*

3. Capitatae.

Represented by one species.....4. *C. capitata.*

4. Foetidae.

Represented by one species in our range.....5. *C. vernacula.*

5. Divisae.

Rootstocks, slender, light-brownish; culms obtusely triangular, normally smooth.....
6. *C. douglasii.*
Rootstocks stout; culms acutely triangular, normally rough above.
Perigynia chestnut, thick, the beak about one-fifth as long as the body..7. *C. simulata.*
Perigynia blackish in age, the beak one-third to one-half as long as the body.
Scales very dark chestnut-brown, shining; perigynia 3.5 to 4.5 mm. long, polished, scarcely hyaline at orifice.....8. *C. pansa.*
Scales lighter colored, dull; perigynia 3 to 4 mm. long, dull, strongly hyaline at orifice.....9. *C. praegracilis.*

6. Muhlenbergianae.

Densely cespitose; head orbicular or oblong-ovoid.....10. *C. hoodii.*
Rootstocks elongate; head linear, interrupted.....11. *C. tumulicola.*

7. Multiflorae.

Scales strongly hyaline-margined; sheaths normally not cross-rugulose.
Perigynia lanceolate-ovate, sharp-margined to base, membranaceous, straw-colored...
12. *C. stenoptera.*
Perigynia ovate, truncate at base, short-beaked, sharp-margined above, not membranaceous, brownish-black at maturity.....13. *C. alma.*
Scales not strongly hyaline-margined; sheaths normally more or less cross-rugulose; perigynia straw-colored, yellowish or tawny at maturity, sharp-margined to base.
Perigynia 3.5 to 4.5 mm. long, the beak much shorter than the body; pistillate scales (except lowest) acute or cuspidate.
Ligule conspicuous, as long as wide; scales brownish-tinged; perigynia strongly nerved ventrally.....14. *C. densa.*
Ligule very short; scales reddish-brown tinged.
Perigynia flat and nerveless or nearly so ventrally, the body sparingly serrulate above, contracted into a beak.....15. *C. vicaria.*
Perigynia low-convex and strongly nerved ventrally, the body strongly serrulate above, abruptly contracted into a beak..16. *C. breviligulata.*
Perigynia 2.25 to 3.25 mm. long, the beak about length of the body; pistillate scales strongly awned.....17. *C. dudleyi.*

8. Paniculatae.

Leaf-blades 1.25 mm. wide; head little interrupted; perigynia 2 to 2.75 mm. long, shining, not concealed by the scales.....18. *C. diandra.*
Leaf-blades 2.5 to 6 mm. wide; head interrupted, compound; perigynia 3 to 4 mm. long, dull, concealed by the scales.....19. *C. cusickii.*

9. Stenorhynchae.

Perigynia 3 to 4 mm. long, the beak much shorter than the body; scales strongly dark-tinged.
Leaves clustered at base; sheaths not green and white mottled dorsally; culms slender.....20. *C. jonesii.*

Leaves not clustered at base, the lower blades much reduced; sheaths green and white mottled dorsally; culms stout.....21. *C. nervina.*
Perigynia 4 to 6 mm. long, the beak about length of body; scales not or scarcely dark tinged.....22. *C. stipata.*

10. Stellulatae.

Spikes more or less widely separate, not brownish-black.
Body of perigynium broadest near middle; beak with few weak serrulations.....23. *C. laeviculmis.*
Body of perigynium broadest near base; beak strongly serrulate.
Beak of perigynium bluntly bidentate, ¼ to ⅓ length of body, the ventral suture obsolete or inconspicuous; scale obtuse, ½ length of body of perigynium.....24. *C. interior.*
Beak of perigynium sharply bidentate, the ventral suture conspicuous.
Beak of perigynium chestnut-brown tipped; culms obtusely triangular; pistillate scales obtuse or obtusish, chestnut-brown tinged with broad shining margins and apex, rounded and not keeled, the midvein obscure at apex.
Spikes widely separate, the terminal long-clavate; perigynia 3.5 to 4 mm. long.....25. *C. ormantha.*
Spikes approximate, the terminal short-clavate; perigynia 3.75 to 4.5 mm. long.....26. *C. phyllomanica.*
Beak of perigynium reddish-brown tipped; culms sharply triangular; pistillate scales obtusish to cuspidate, yellowish-brown tinged, the margins and apex narrow, opaque or dull whitish, keeled with the sharp midvein which is prominent to apex.....27. *C. angustior.*
Spikes 3 to 5 in a small (6 to 10 mm. long), densely capitate, brownish-black head.....28. *C. illota.*

11. Deweyanae.

Perigynia shallowly bidentate, 3.5 to 4 mm. long, the beak about ⅓ length of body.....29. *C. leptopoda.*
Perigynia deeply bidentate, 4 to 4.5 mm. long, the beak about ½ length of body.....30. *C. bolanderi.*

12. Ovales.

Sheaths green-striate opposite blades, except at mouth.....31. *C. feta.*
Sheaths white-hyaline opposite blades.
Sheaths strongly prolonged upward at mouth opposite blade in a very membranaceous appendage; perigynia and scales greenish.....32. *C. fracta.*
Upper sheaths (at least) concave or truncate at mouth opposite blades.
Beak of perigynium flat and serrulate to the usually strongly bidentate tip.
Perigynia 3.5 to 5 mm. long, 2 to 3 mm. wide.
Perigynia thin with margins conspicuously wrinkled dorsally; culms 1 to 4 dm. high; spikes ovoid, densely capitate.....33. *C. straminiformis.*
Perigynia thick with margins not wrinkled dorsally; culms 3 to 9 dm. high; spikes oblong in an oblong head....34. *C. multicostata.*
Perigynia 3 to 3.5 mm. long, 1 to 1.5 mm. wide.....35. *C. subfusca.*
Beak of perigynium terete toward apex, the upper 1 to 3 mm. smooth or nearly so.
Perigynia appressed, nearly or entirely covered by scales, the beaks not conspicuous in the spikes.
Culms slender; spikes in a flexuous nodding head.....36. *C. praticola.*
Culms stiff; spikes approximate in an erect head.
Culms 1 to 6 dm. high, the leaves not bunched near base; blades 2 to 3 mm. wide, flat; beak of perigynium not hyaline at orifice.....37. *C. tracyi.*
Culms 1 to 3 dm. high, in large tufts, the leaves bunched near base; blades 1.5 to 2 mm. wide, more or less involute; perigynium beak hyaline at orifice.
Perigynia oblong-ovate, rather strongly margined.....38. *C. phaeocephala.*
Perigynia linear-lanceolate, very narrowly margined, boat-shaped.....39. *C. leporinella.*
Upper part of perigynia conspicuous in the spikes, not covered by scales.
Perigynia lanceolate, 5.5 to 8.5 mm. in length, 3 to 5 times as long as wide.
Spikes about three, not capitate; scales little more than ½ length of perigynia.....40. *C. davyi.*
Spikes 6 to 12, capitate; scales equaling bodies of perigynia.....41. *C. specifica.*
Perigynia ovate or if lanceolate shorter than 5.5 mm. in length.
Lower bracts leaflet-like, much exceeding head.
Perigynia with the beak ferruginous at orifice, bidentate; lowest bract appearing like a continuation of the culm.....42. *C. unilateralis.*
Perigynia with the beak hyaline at orifice, bidentulate; lowest bract not appearing like a continuation of the culm
43. *C. athrostachya.*

Lower bracts scale-like, much shorter than or slightly exceeding head.
Perigynia with membranaceous or submembranaceous walls.
Perigynia thin and flat save where distended by achene.
Perigynia 3.5 to 5 mm. long; culms slender.....
44. *C. festivella.*
Perigynia 4.5 to 6 mm. long; culms low, ascending or decumbent.....45. *C. nubicola.*
Perigynia strongly plano-convex at maturity.
Perigynia nerveless ventrally or with impressed nerves.....46. *C. pachystachya.*
Perigynia with conspicuously raised nerves on inner face.
Perigynia conspicuously hyaline-tipped; spikes densely capitate.....47. *C. abrupta.*
Perigynia reddish-tipped; spikes more or less strongly separate..48. *C. mariposana*
Perigynia with thick, firm walls.
Perigynia very small (2.25 to 3.5 mm. long).
Margins of perigynia entire (or very obscurely subserrulate).....49. *C. integra.*
Margins of perigynia strongly serrulate.....
50. *C. teneraeformis.*
Perigynia longer (3.5 mm. long or more).
Lower bracts (at least) strongly amplectant; beaks of perigynia and scales little reddish-tinged.
51. *C. amplectens.*
Bracts not amplectant; beaks of perigynia and scales strongly reddish-tinged.
Perigynia strongly nerved ventrally, the nerves prominent; scales with sharply defined midvein.
Sterile shoots not conspicuous; lower bladeless sheaths short; culms slender; scales mostly acute, reddish-brown..52. *C. harfordii.*
Sterile shoots numerous, elongate; lower bladeless sheaths very long; culms very slender; scales cuspidate or short-awned, yellowish-brown.....53. *C. montereyensis.*
Perigynia nerveless or very obscurely nerved ventrally.
Perigynia with a few raised nerves dorsally; coastal species.
Spikes strongly capitate; leaf-blades averaging 2.5 to 3 mm. wide; culms 3.5 to 12 dm. high...54. *C. sub-bracteata.*
Spikes not capitate, the head slender; leaf-blades averaging 1.5 to 2 mm. wide; culms 1 to 6 dm. high...55. *C. gracilior.*
Perigynia many-striate or with impressed nerves dorsally; species of the Sierra Nevada.
Spikes not few-flowered; culms slender; leaves not clustered, the blades long.....
56. *C. pachycarpa.*
Spikes 6 to 12-flowered; culms stiff; leaves clustered, the blades short...57. *C. paucifructus.*

13. Canescentes.

Spikes androgynous; perigynia unequally biconvex.....58. *C. disperma.*
Spikes gynaecandrous; perigynia plano-convex.
Perigynia broadest near middle, short-beaked, smooth or little roughened.....
59. *C. canescens.*
Perigynia ovate, broadest near the base; beak conspicuous, strongly serrulate.....
60. *C. arcta.*

14. Polytrichoideae.

Represented by one species.....61. *C. leptalea.*

15. Firmiculmes.

Not stoloniferous; culms smooth, terete; leaf-blades 1.5 mm. wide; bracts long-awned....
62. *C. multicaulis.*
Stoloniferous; culms very rough, triangular: leaf-blades 2 to 3.5 mm. wide; bracts not long-cuspidate.....63. *C. geyeri.*

16. Filifoliae.

Represented by one species in our range....64. *C. exserta.*

17. Scirpinae.

Represented by one species in our range....65. *C. gigas.*

18. Montanae.

Basal spikes not developed....66. *C. inops.*
Basal spikes present.
Perigynia finely many-ribbed as well as strongly 2-keeled.
Scales purplish-tinged, obtuse to cuspidate; body of perigynium globose; staminate spikes many-flowered; basal pistillate spikes on elongated very slender peduncles....67. *C. globosa.*
Scales reddish-brown tinged, cuspidate or long-awned; body of perigynium oval; staminate spikes few-flowered; basal pistillate spikes on short, erect peduncles....68. *C. brainerdii.*
Perigynia strongly 2-keeled, otherwise nerveless.
Bract of lowest non-basal pistillate spike leaflet-like, exceeding culms, if at all colored, purplish-brown tinged at base.
Perigynia 2.5 to 3 mm. long, the beak 0.25 to 0.75 mm. long, shallowly bidentate....69. *C. brevipes.*
Perigynia 3 to 4.5 mm. long, the beak 0.75 to 1.50 mm. long, bidentate....
70. *C. rossii.*
Bract of lowest non-basal pistillate spike squamiform and shorter than culm or, if longer, auriculate and strongly reddish-brown tinged at base....
71. *C. brevicaulis.*

19. Digitatae.

Represented by one species in our range....72. *C. concinnoides.*

20. Bicolores.

Perigynia short-tapering at apex, straw-colored, 2.5 to 3.75 mm. long; achenes strongly apiculate....73. *C. salinaeformis.*
Perigynia rounded or truncate at apex, orange-colored or white-pulverulent, smaller; achenes minutely apiculate.
Mature perigynia whitish, ellipsoidal, not fleshy or translucent, rather obscurely ribbed; scales appressed....74. *C. hassei.*
Mature perigynia orange or brownish, broader, fleshy or translucent, strongly ribbed; scales divaricate at maturity....75. *C. aurea.*

21. Paniceae.

Perigynia beakless or nearly so; bract sheaths short; plant glaucous; leaf-blades narrow, involute....76. *C. livida.*
Perigynia strongly beaked; bract sheaths long; plant not glaucous; leaf-blades broad, flat..
77. *C. californica.*

22. Laxiflorae.

Represented by one species in our range....78. *C. hendersonii.*

23. Triquetrae.

Lowest bract sheathless or very short-sheathing; perigynia glabrous, strongly ribbed or nerved.
Perigynia ovoid, 3.5 to 4.25 mm. long, abruptly short-beaked, the sides several-nerved....79. *C. flaccifolia.*
Perigynia ovoid-lanceolate, 3.75 to 5 mm. long, tapering into the beak, the sides strongly ribbed....80. *C. whitneyi.*
Lowest bract long-sheathing; perigynia hairy, faintly nerved or nerveless.
Leaf-blades hairy; pistillate spikes oblong or short-oblong, the upper approximate.
Perigynia 4 to 5 mm. long, round-tapering at base, finely many-nerved....
81. *C. gynodynama.*
Perigynia 3.5 to 4 mm. long, tapering at base, 2-keeled, obscurely striate....
82. *C. hirtissima.*
Leaf-blades not hairy; pistillate spikes linear, widely separate....83. *C. triquetra.*

24. Debiles.

Represented by one species in our range....84. *C. mendocinensis.*

25. Frigidae.

Perigynia triangular or slightly flattened, the beak bidentulate; scales obtusish, the mid-vein not prominent at apex.
Spikes widely separate, the staminate one strongly overtopping the uppermost pistillate one; perigynia triangular, 3.5 mm. long or less....85. *C. lemmonii.*
Uppermost pistillate spikes bunched, little exceeded by the staminate one; perigynia compressed-triangular, longer.

Pistillate spikes oblong; scales reddish-brown.....86. *C. luzulina.*
Pistillate spikes linear-oblong; scales dark-tinged.....87. *C. ablata.*
Perigynia strongly flattened, the beak bidentate; scales sharp-pointed with midvein prominent to apex.
Perigynia glabrous; scales smooth; bract sheaths strongly enlarged upward; leaf-blades very leathery.....88. *C. luzulaefolia.*
Perigynia sparsely hairy; scales more or less hairy; bract sheaths scarcely enlarged upward; leaf-blades not leathery.....89. *C. fissuricola.*

26. Anomalae.

Represented by one species in our range.....90. *C. amplifolia.*

27. Atratae.

Terminal spike staminate or sometimes with perigynia in the middle.
Basal sheaths not filamentose.
Culms few-leaved, strongly aphyllopodic.....91. *C. spectabilis.*
Culms many-leaved, clothed at base with dried-up leaves of previous year.....92. *C. raynoldsii.*
Basal sheaths filamentose.....93. *C. bifida.*
Terminal spike gynaecandrous, i. e., the terminal flowers pistillate.
Culms aphyllopodic, strongly purplish-red at base, the lower sheaths filamentose.....94. *C. buxbaumii.*
Culms phyllopodic.
Spikes 3 to 5, not oblong-cylindric; perigynia walls not papery; perigynia 2.5 to 4.5 mm. long, nerveless or obscurely nerved on face, dull green to brownish-black.
Perigynia not papillate-roughened.
Spikes contiguous, sessile or nearly so, forming a dense head; scales lanceolate, strongly exceeding perigynia; culms stiff, erect..95. *C. helleri.*
Lower spike or spikes more or less peduncled, usually distant, erect or nodding; scales wider, shorter than or about equaling perigynia; culms more slender.
Scales with midvein largely obsolete; mature perigynia 3.5 to 4.5 mm. long, as wide or wider on either side than achene, the latter on stipe of nearly its own length; sheaths not purplish-tinged ventrally.....96. *C. epapillosa.*
Scales with prominent midvein; mature perigynia 3.5 mm. long, narrower on either side than achene, the latter much longer than its stipe; sheaths normally purplish-tinged ventrally.....97. *C. heteroneura.*
Perigynia papillate-roughened, especially on upper margins.98. *C. albo-nigra.*
Spikes 6 to 10, oblong-cylindric; perigynia 5 mm. long, lightly 3-nerved, light green, the walls papery; scales much shorter than perigynia.....99. *C. mertensii.*

28. Acutae.

A. Flowering culms arising from the center of previous year's tuft of leaves and surrounded at base with dried-up leaves of previous year.

1. *Lower sheaths of flowering culms not breaking and becoming filamentose.*

Strongly stoloniferous, the culms arising one to few together, low; lowest bract normally much shorter than inflorescence; scales with obsolete or slender midvein.
Dried first year leaf-blades at base of fertile culms stiff, rigid and conspicuous, concealing the culms; fertile culm leaves all blade-bearing, the lower sheaths not purplish or hispidulous dorsally.....100. *C. scopulorum.*
Dried first year leaf-blades at base of fertile culms much desiccated, not stiff, rigid or conspicuous, and not concealing the culms; lowest fertile culm leaves not blade-bearing, the lower sheaths purplish and more or less strongly hispidulous dorsally.....101. *C. gymnoclada.*
Culms taller, less stiff, in larger clumps; lowest bract equaling or exceeding inflorescence; scales with slender midvein or broader light colored center.
Perigynia strongly nerved ventrally, the nerves raised.
Perigynia coriaceous, sessile or nearly so, the beak bidentate; strongly stoloniferous.....102. *C. nebraskensis.*
Perigynia membranaceous, more or less slenderly stipitate, the beak entire; cespitose.
Perigynia substipitate, orbicular, minutely papillate-roughened; scales deciduous.....103. *C. paucicostata.*
Perigynia strongly stipitate, ovate.
Perigynia yellowish-green, ribbed, papillate-roughened; scales deciduous.104. *C. hindsii.*
Perigynia light green or in age glaucous green, nerved, very minutely granular; scales long persistent.....105. *C. kelloggii.*
Perigynia nerveless ventrally or with obscure impressed nerves.
Sheaths colored ventrally at mouth; lower pistillate spikes cernuous or subcernuous on long peduncles; scales in age whitened at tip.....106. *C. sitchensis.*
Sheaths not colored ventrally at mouth; lower pistillate spikes not nodding; scales not whitened at tip.....107. *C. aquatilis.*

2. *Lower or middle sheaths of flowering culms breaking and becoming filamentose.*

Beak of perigynium bidentate, hispidulous between teeth; scales strongly rough-awned.... 108. *C. barbarae.*
Beak of perigynium entire or emarginate, not hispidulous between teeth; scales not rough-awned.
Lower culm sheaths strongly yellowish-brown tinged, sharply keeled; culms stout, the leaf-blades 6 to 12 mm. wide.....109. *C. schottii.*
Lower culm sheaths purplish-tinged, not sharply keeled; culms more slender, the leaf blades narrower.....110. *C. senta.*

B. Some or all of the flowering culms arising laterally and not enveloped at base by previous year's tuft of leaves.

Culms very densely cespitose, forming dense stools; lowest sheaths strongly filamentose; lowest bract little developed, usually much exceeded by inflorescence..... 111. *C. nudata.*
Culm much less densely cespitose, forming beds, conspicuously stoloniferous; lowest bract well-developed, from somewhat shorter than to exceeding inflorescence.
Perigynia orbicular or nearly so.....112. *C. eurycarpa.*
Perigynia oblanceolate.....113. *C. oxycarpa.*

29. Cryptocarpae.

Perigynia dull, straw-colored or light brown, slightly granular; lower sheaths of sterile shoots not filamentose.....114. *C. lyngbyei.*
Perigynia shining, brown, smooth; lower sheaths of sterile shoots strongly filamentose.... 115. *C. obnupta.*

30. Trachychlaenae.

Represented by one species in our range.....116. *C. spissa.*

31. Hirtae.

Beak of perigynium obliquely cut, shallowly bidentate at maturity; foliage pubescent; staminate scales long-ciliate.....117. *C. yosemitana.*
Beak of perigynium deeply bidentate; staminate scales at most erose.
Foliage not pubescent; teeth of perigynium beak short.
Lowest bract strongly sheathing; fertile culms phyllopodic with many leaves, the sheaths not breaking and becoming filamentose..118. *C. oregonensis.*
Lowest bract not sheathing; fertile culms aphyllopodic with few leaves, the sheaths breaking and becoming filamentose.....119. *C. lanuginosa.*
Sheaths and under surface of leaf-blades hairy; teeth of perigynium beak conspicuous.....120. *C. sheldonii.*

32. Extensae.

Represented by one species in our range.....121. *C. viridula.*

33. Physocarpae.

Perigynia ascending; lower sheaths more or less strongly filamentose; culms sharply triangular.
Perigynia 4 to 8 mm. long, abruptly contracted into beak.....122. *C. vesicaria.*
Perigynia 7 to 10 mm. long, tapering into beak.....123. *C. exsiccata.*
Perigynia spreading at maturity; lower sheaths not filamentose; culms bluntly triangular below spikes.....124. *C. rostrata.*

34. Pseudo-Cypereae.

Perigynia suborbicular in cross-section, more or less inflated; teeth of perigynium beak 0.5 to 1 mm. long.....125. *C. hystricina.*
Perigynia obtusely triangular, scarcely inflated, closely enveloping achene; teeth of perigynium beak 1.5 to 2 mm. long, recurved or spreading.....126. *C. comosa.*

Sect. 1. Inflatae Kük. Cespitose, the rootstocks elongate. Leaf-blades filiform. Spike solitary, ovoid, androgynous, densely flowered, bractless. Perigynia inflated, the walls very thin, slightly nerved, sessile, the smooth beak hyaline-tipped, obliquely cut, in age bidentulate. Achenes triangular. Stamens 3.

1. **C. engelmánnii** Bailey. Culms 5 to 20 cm. high; spike 10 to 15 mm. long, 6 to 10 mm. wide, the lower ¾ pistillate; scales acute to cuspidate, all except lower shorter than perigynia; perigynia 4.5 to 5 mm. long, 2.25 mm. wide.—Alpine peaks or meadows, Sierra Nevada in Tulare Co.; n. to Wash., e. to Col.

2. **C. brèweri** Boott. Fig. 159. Culms 1 to 2.5 dm. high; spike 1 to 2 cm. long, 6 to 10 mm. wide, the upper third staminate; scales ovate, short-acuminate, narrower and shorter than perigynia; perigynia 5 mm. long, 3.5 mm.

159. Carex breweri Boott; *a*, habit x ⅔; *b*, scale x 2⅔; *c*, perigy. x 2⅔.

wide.—High alpine peaks of the Sierra Nevada from Mt. Whitney to Mt. Shasta; n. to Wash.

Sect. 2. Athrochlaenae Holm. Cespitose or with creeping rootstocks. Leaf-blades narrow. Spike solitary, androgynous, bractless, narrow, densely many-flowered. Pistillate scales soon falling. Perigynia slenderly strongly stipitate, widely spreading or the lower reflexed, obscurely triangular, nerveless, membranaceous, long-beaked, the beak obliquely cut, becoming bidentulate. Achenes usually triangular, slightly apiculate. Stigmas 3 or occasionally 2.

160. Carex nigricans C. A. Mey.; *a*, habit x ⅔; *b*, infl. x ⅔; *c*, scale x 3; *d*, perigy. x 3.

3. **C. nígricans** C. A. Mey. Fig. 160. Culms 5 to 30 cm. high, stiff, firm, smooth; leaves 4 to 9 to a fertile culm, the blades 1.5 to 3 mm. wide, flat, or channeled at base; spike 8 to 15 mm. long, 6 to 9 mm. wide, the upper half staminate, the lower with 10 to 25 perigynia; scales ovate, obtuse to acutish, dark-brown tinged with hyaline margins, shorter than perigynia; perigynia 4 mm. long, brownish, tapering into a smooth beak.—Arctic alpine in the Sierra Nevada, from Tulare Co. to Eldorado Co.; n. to Alas., e. to Col.

161. Carex capitata L.; *a*, habit x ½; *b*, scale x 4; *c*, perigy. x 4.

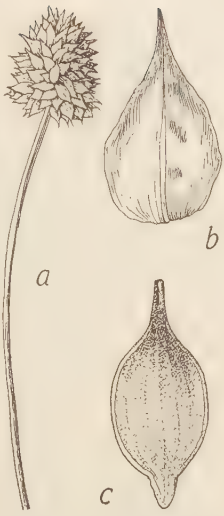
Sect. 3. Capitatae Christ. Cespitose. Leaf-blades filiform. Spike solitary, ovoid, androgynous, densely flowered, bractless. Perigynia plano-convex, sharp-edged, not inflated, essentially nerveless, sessile, the walls thinnish, the smooth terete beak conspicuously hyaline-tipped, in age bidentulate. Achenes lenticular, apiculate. Stigmas 2.

4. **C. capitàta** L. Arctic Sedge. Fig. 161. Culms 1 to 3.5 dm. high, roughish above, the basal sheaths purplish; spike 4 to 10 mm. long; scales ovate-orbicular, obtuse, shorter and narrower than perigynia, chestnut-brown with broad hyaline margins; perigynia 2 to 3 mm. long, pale green, smooth, rounded at base, the abrupt beak slender, dark-colored, less than 1

mm. long.—Sierra Nevada in Fresno and Tulare Cos., 6500 to 8000 ft.; n. to Alas., e. to Greenland, s. to Mex.

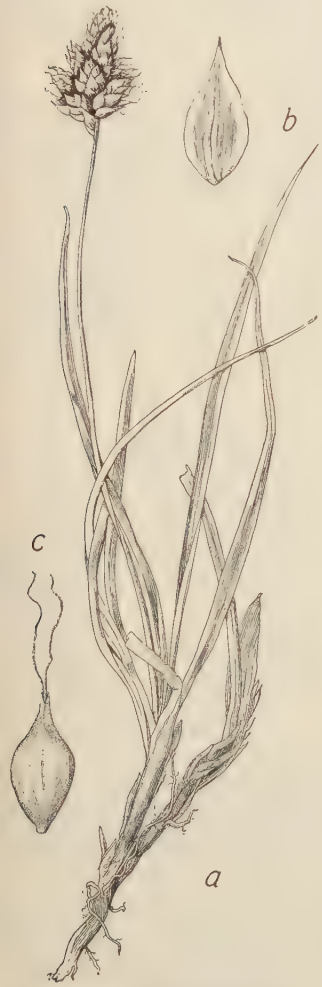
Sect. 4. Foetidae Tuckerm. Leaf-blades narrow. Spikes few to several, androgynous, in a dense subglobose or ovoid head. Perigynia spreading, plano-convex, membranaceous, usually obsoletely nerved, loosely enveloping the achene, rounded at base, stipitate, the beak obliquely cut, at times bidentulate. Achenes lenticular. Stigmas 2.

5. **C. vernácula** Bailey. Fig. 162. Culms 0.5 to 2 dm. high, smooth; leaf-blades 2 to 4 mm. wide, stiff; head about 1 cm. in diameter, the staminate flowers inconspicuous; scales ovate, brown, sharp-pointed, rather wider and from shorter to longer than perigynia; perigynia ovoid, 3.5 to 4.5 mm. long, not margined, tapering into the smooth beak ⅓ length of body.—Alpine slopes, Sierra Nevada from Tulare Co. to Modoc Co.; n. to Wash., e. to Col.



162. Carex vernacula Bailey; *a*, infl. x 1; *b*, scale x 8; *c*, perigy. x 8.

Sect. 5. Divisae Christ. Culms arising singly or in small clumps at intervals, mostly stiff, dark-tinged at base, aphyllopodic. Leaf-blades narrow. Spikes few to many, ovoid or oblong, androgynous or dioecious. Heads in some species dioecious or nearly so. Lower one to several bracts developed, short-prolonged, the others bract-like. Perigynia appressed-ascending, plano-convex, smooth, often shining, coriaceous, more or less nerved on outer surface, sharp-edged but not wing-margined, rounded and spongy at base, the obliquely cut beak in age bidentulate. Achenes lenticular, closely enveloped. Stigmas 2.

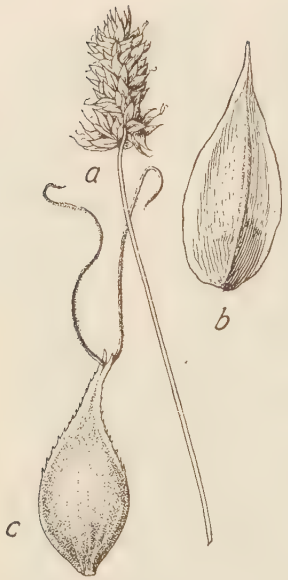


163. Carex pansa Bailey; *a*, habit x ⅔; *b*, scale x 5; *c*, perigy. x 5.

6. **C. douglâsii** Boott. Douglas Sedge. Culms 6 to 30 cm. high; leaf-blades 1 to 2.5 mm. wide, involute above and flat or channeled at base; heads dioecious or nearly so; staminate spikes linear-elliptic, 8 to 15 mm. long, 2.5 to 4 mm. wide, the scales straw-colored or brownish, pointed; pistillate spikes wider, the scales ovate to lanceolate, concealing the perigynia, yellowish-brown, with broad hyaline margins and lighter center; perigynia lanceolate, 4 mm. long, lightly nerved ventrally, strongly nerved dorsally, tapering into a strongly serrulate beak nearly 2 mm. long, its apex hyaline; styles elongate.—Dry or alkaline soil along or e. of the Sierra Nevada from Modoc Co. to Inyo Co.; sw. to Mt. Pinos; n. to B. C., e. to Neb.

7. **C. simulàta** Mkze. Culms 3 to 5 dm. high; leaf-blades 2 to 4 mm. wide, flat; head linear-oblong or oblong-ovoid, 12 to 25 mm. long, the 5 to 15 spikes pistillate, staminate or androgynous; scales concealing the perigynia, cuspidate, brown with hyaline margins; perigynia broadly ovate, 1.8 to 2.25 mm. long, nerveless ventrally, serrulate above, abruptly beaked, the beak 0.25 mm. long.—Wet soil, w. slope or mostly e. slope of the Sierra Nevada from Fresno Co. to Sierra Co. and n.; n. to Wash., e. to Col.

8. **C. pánsa** Bailey. Fig. 163. Culms 1.5 to 3 dm. high; leaf-blades 1 to 3 mm. wide; head



164. Carex hoodii Boott; *a*, infl. x 1; *b*, scale x 7½; *c*, perigy. x 7½.

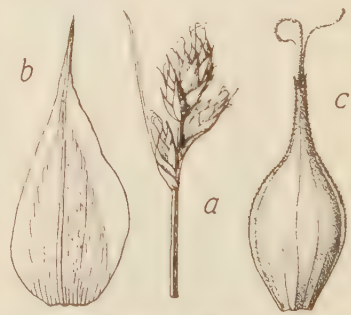
1.5 to 2.5 cm. long, the spikes lance-ovoid, 7 to 10 mm. long, the several to many perigynia appressed; scales with conspicuous white-hyaline margins, concealing perigynia; perigynia oblong-lanceolate, nerveless ventrally, tapering at apex, the beak 1 mm. long, serrulate.—Drifting sands along the seacoast from Monterey Co. to Del Norte Co.; n. to Wash.

9. **C. praegrácilis** W. Boott. FIELD SEDGE. Culms 2 to 7.5 dm. high; leaf-blades 1.5 to 3 mm. wide, flattened or canaliculate; head 1 to 5 cm. long, the 5 to 15 spikes densely aggregated, androgynous, with 4 to 10 perigynia; scales ovate-lanceolate, acute to cuspidate, nearly concealing the perigynia; perigynia nerved on the outer, nearly nerveless on the inner face.—Meadows, widely distributed except on the higher mts.; n. to Alas., e. to Iowa, s. to Mex.

SECT. 6. MUHLENBERGIANAE Tuckerm. Cespitose or with more or less elongated rootstocks. Culms not flattened. Spikes few, androgynous or pistillate but never gynaecandrous, rarely compound. Perigynia plano-convex, appressed to reflexed, often strongly spongy at base, narrowly sharp-margined, conspicuously beaked, the beak sharply bidentate. Achenes lenticular. Stigmas 2.

10. **C. hóodii** Boott. Fig. 164. Culms 3 to 8 dm. high; leaf-blades 1.5 to 3.5 mm. wide; head 1 to 2 cm. long, the spikes with 5 to 10 ascending perigynia; scales ovate, sharp-pointed, chestnut-brown with lighter keel and broad hyaline margins; perigynia lance-ovate, 4 to 5 mm. long, green-margined above, the beak ⅓ length of body.—Mountain meadows and slopes, Sierra Nevada from Tulare Co. to Shasta Co.; n. to B. C., e. to Col.

11. **C. tumulícola** Mkze. FOOTHILL SEDGE. Fig. 165. Culms 2 to 8 dm. high; leaf-blades 1.5 to 2.5 mm. wide; head 2 to 5 cm. long, slender, the upper spikes aggregated, the lower separate, with 10 or fewer appressed perigynia; lower bracts long-cuspidate; scales largely concealing perigynia, brownish straw-color with hyaline margin and green midrib, acuminate to cuspidate; perigynia lanceolate, 4 to 5 mm. long, the serrulate beak ⅓ to ½ length of body.—Dry soil, 50 to 2000 (or 5000) ft.: coastal counties from Monterey Co. to Humboldt Co.; Sierra Nevada from Tuolumne Co. to Calaveras Co.; n. to Wash.

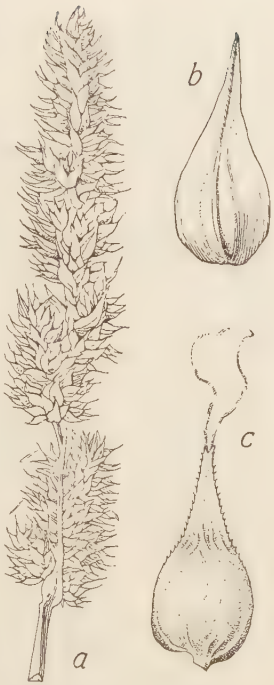


165. Carex tumulicola Mkze.; *a*, infl. x 1; *b*, scale x 7½; *c*, perigy. x 7½.

SECT. 7. MULTIFLORAE Kunth. Densely cespitose. Culms sharply triangular. Opaque part of sheaths usually transversely rugulose, red-dotted. Spikes numerous, small, androgynous or pistillate, but never gynaecandrous, the lower more or less compound. Bracts frequently conspicuous. Perigynia plano-convex, appressed-ascending or spreading, not thick-walled, somewhat spongy at base, short-stipitate, sharp-margined, more or less nerved, conspicuously rough-beaked, the beak bidentate. Achenes lenticular. Stigmas 2.

12. **C. stenóptera** Mkze. Culms 2.5 to 4 dm. high; leaf-blades 2 to 3 mm. wide, channeled, the sheaths tight; head decompound, 2 to 5.5 cm. long, with spikes 5 to 8 mm. long, 4 to 6 mm. wide; bracts inconspicuous; scales ovate-lanceolate, obtusish to short-cuspidate, brownish, exceeding perigynia; perigynia 3 to 3.5 mm. long, nerved dorsally, nerveless ventrally or nearly so, round-tapering at base, tapering into a serrulate beak about ½ length of body.—San Antonio Mts., S. Cal.

13. **C. álma** Bailey. Fig. 166. Culms 3 to 12 dm. high, strict, rough on angles; leaf-blades 3 to 6 mm. wide; head 2.5 to 20 cm. long, decompound, the clusters closely aggregated to strongly separate; scales ovate, short-pointed to obtusish, straw-colored or brownish; perigynia 3.5 to 4 mm. long, smooth, shining, narrowly green-margined, serrulate from middle, lightly few-nerved on both sides, tapering into the serrulate beak.—Along streams, Monterey and Tulare Cos. to S. Cal.; e. to s. Nev. and Ariz.



166. Carex alma Bailey; *a*, infl. x 1; *b*, scale x 8; *c*, perigy. x 8.

14. **C. dénsa** Bailey. Fig. 167. Culms 3 to 6 dm. high, smooth or roughened above, from exceeding to shorter than the leaves; leaf-blades 3 to 6 mm. wide, the sheaths septate dorsally, and thin, hyaline and more or less cross-rugulose ventrally, prolonged and convex at the mouth; head 2 to 5 cm. long; bracts inconspicuous, except 1 or 2 lower ones; perigynia 3.5 to 4.5 mm. long, strongly convex dorsally, ovate or ovate-lanceolate from a round-tapering base, narrowly green-margined, serrulate above middle, the beak about ½ length of body.—Dry soil, cismontane: Sierra Nevada from Mariposa Co. n.; Marysville Buttes; Coast Ranges from Santa Clara Co. n.; n. to Ore.

167. Carex densa Bailey; *a*, infl. x 1; *b*, scale x 7½; *c*, perigy. x 7½.

15. **C. vicària** Bailey. Rusty Sedge. Culms 3 to 6 dm. high, exceeding the leaves, rough above; leaf-blades 3 to 4.5 mm. wide, the sheaths tight, not conspicuously septate dorsally, thin-hyaline and more or less cross-rugulose ventrally, short-prolonged and convex at mouth; head 1.5 to 3 cm. long; bracts inconspicuous except 1 or 2 lower ones; perigynia 3 to 3.5 mm. long, ovate from a rounded base, green-margined, serrulate above middle, the beak ½ length of body.—Marshes, Mendocino Co. (Round Valley); n. to Wash.

16. **C. brevilígulàta** Mkze. Culms 3 to 6 dm. high, exceeding leaves, rough above; leaf-blades 3 to 4.5 mm. wide, the sheaths tight, not conspicuously septate dorsally, thin-hyaline and more or less cross-rugulose ventrally, truncate at mouth; head 1.5 to 3.5 cm. long; bracts usually not conspicuous; perigynia 3.25 to 3.75 mm. long, ovate from a round-tapering base, green-margined, serrulate from middle, the beak ½ length of body.—Marshes and swales: North Coast Ranges; Sierra Nevada; n. to Ore.

17. **C. dúdleyi** Mkze. Culms 3 to 7 dm. high, rough above, exceeding leaves; leaf-blades 4 to 7 mm. wide, the sheaths tight, inconspicuously septate dorsally, white-hyaline and scarcely cross-rugulose ventrally, the ligule as long as wide; head 2 to 3.5 cm. long; bracts setaceous, the lower conspicuous; perigynia narrowly ovate from a rounded base, brownish-yellow with green margin, nerved ventrally, the beak serrulate.—Coast Ranges from Monterey Co. to Lake Co.; apparently local.

168. Carex cusickii Mkze.; *a*, infl. x 1; *b*, scale x 7½; *c*, perigy. x 7½.

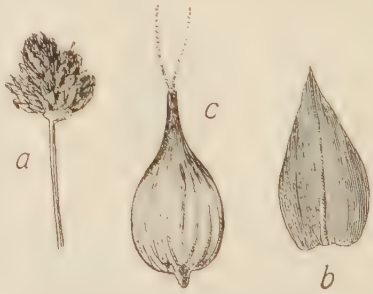
Sect. 8. Paniculatæ Kunth. Densely or loosely cespitose. Culms not flattened. Opaque part of leaf-sheaths strongly red-dotted. Spikes numerous, small, androgynous or pistillate, but never gynaecandrous, the lower compound or decompound. Bracts usually inconspicuous. Perigynia thick, high convex on the dorsal and often somewhat convex on the ventral face, ascending or spreading, coriaceous, spongy at base, stipitate, narrowly margined, more or less nerved, conspicuously rough-beaked, the beak bidentate. Achenes lenticular. Stigmas 2.

18. **C. diándra** Schrank. Culms 3 to 7 dm. high, slender; leaf-blades canaliculate at base; sheaths not copper-colored at mouth; head 2.5 to 5 cm. long; scales acute, brownish; perigynia round-truncate at base, the beak serrulate.—Wet meadows, very local: San Bernardino Valley; Oriole Lake, Tulare Co.; n. to Alas. e. to Newf.

19. **C. cusíckii** Mkze. Fig. 168. Culms stout, 7 to 12 dm. high; leaf-blades flat with slightly revolute margins, the sheaths copper-tinged at mouth; head 4 to 8 cm. long; scales chestnut-tinged; perigynia truncate at base, the beak setulose-serrulate. — Wet meadows near the coast from San Francisco to Del Norte Co. Rare. N. to B. C., e. to Mont.

Sect. 9. Stenorhynchae Holm. Densely cespitose or with more or less elongated rootstocks. Culms triangular or somewhat flattened. Opaque part of leaf-sheaths usually transversely rugulose or red-dotted. Spikes few to many, androgynous or pistillate, but never gynaecandrous, the lower simple to compound. Bracts little developed. Perigynia plano-convex, yellowish or yellowish-brown, appressed-ascending to spreading, not thick-walled but strongly spongy at base, stipitate, strongly many-nerved, the margins nearly obsolete on the lower half, conspicuously beaked, the beak bidentate. Achenes lenticular. Stigmas 2.

20. **C. jònesii** Bailey. Fig. 169. Culms 2 to 6 dm. high, slender; leaf-blades 1 to 2 mm. wide; opaque part of sheath white, not cross-rugulose, truncate at mouth; head 8 to 18 mm. long, the larger spikes with 5 to 10 ascending perigynia; scales exceeding or shorter than the perigynia, ovate, dark brown; perigynia ovate-lanceolate, 3 to 4 mm. long, 1.5 mm. wide, the beak very slightly serrulate, ⅓ length of body.—High mountains, 5000 to 7200 ft.: San Bernardino Mts.; Sierra Nevada from Tulare Co. to Siskiyou Co.; n. to Wash., e. to Mont.



169. Carex jonesii Bailey; *a*, infl. x 1; *b*, scale x 7; *c*, perigy. x 7.

170. Carex nervina Bailey; *a*, infl. x 1; *b*, scale x 6; *c*, perigy. x 6.

21. **C. nervina** Bailey. Awl Sedge. Fig. 170. Culms 3 to 9 dm. high, strongly aphyllopodic, slightly flattened in drying; opaque part of sheaths olive-tinged, truncate or concave at the mouth; head 1.5 to 3 cm. long, the larger with 6 to 12 ascending perigynia, the staminate flowers rarely conspicuous; scales ovate, brownish; perigynia ovate-lanceolate, 3.5 to 4 mm. long, the beak

171. Carex stipata Muhl.; *a*, infl. x 1; *b*, scale x 7½; *c*, perigy. x 7½.

smoothish, 1 mm. long, the teeth erect.—High mountains, 4000 to 7000 ft., Sierra Nevada from Tulare Co. to Siskiyou Co.; n. to s. Ore.

22. **C. stipàta** Muhl. Fig. 171. Culms 3 to 12 dm. high, rather weak, sharply triangular, strongly serrulate above; leaf-blades 4 to 8 mm. wide, flat, flaccid, the sheaths strongly septate dorsally, the opaque part thin, quickly broken, cross-rugulose; head 3 to 10 cm. long, yellowish-brown; scales ovate-triangular, light-brownish, about length of body of perigynium; perigynia lanceolate, 4 to 5 mm. long, the serrulate beak longer than or nearly equaling the body. — Swamps and wet meadows: Coast Ranges from Sonoma Co. to Siskiyou Co., thence s. in the Sierra Nevada to Sierra Co.; n. to Alas., e. to Newf.

SECT. 10. STELLULATAE Kunth. Densely cespitose. Culms triangular. Sheaths not red-dotted or cross-rugulose. Spikes 2 to 10, or by reduction 1, gynaecandrous, pistillate or in a few species staminate, not compound. Bracts inconspicuous. Perigynia plano-convex, yellow-brown or brown, spreading at maturity, the body orbicular, ovate or broadly oval, strongly spongy at base, sharp-edged nearly if not entirely to the rounded or truncate base, not puncticulate, nerved on the outer, nerved or nerveless on the inner surface, the beak bidentate or obliquely cut. Achenes lenticular. Stigmas 2.

23. **C. laevicúlmis** Meinsh. Fig. 172. Culms 3 to 7 dm. high, weak; leaf-blades 1 to 2 mm. wide, light green, flat, soft; spikes 3 to 8, widely separate or upper approximate, suborbicular, 3 to 10 mm. long, with 3 to 10 perigynia; uppermost spike long-clavate at base; scales ovate, about length of body of perigynium, with conspicuous green midvein; perigynia green or brownish-green, oblong-ovoid, plano- or concave-convex, 2.5 to 4 mm. long, 1.5 mm. wide, thin-walled, lightly nerved ventrally, the beak ⅓ length of body.—Wet shaded places: Humboldt Co.; n. Sierra Nevada from Eldorado Co. to Butte Co.; n. to Alas. and Ida.

172. Carex laeviculmis Meinsh.; *a*, infl. x 1; *b*, scale x 7; *c*, perigy. x 7.

24. **C. intèrior** Bailey. Culms 1.5 to 5 dm. high, slender and wiry; leaf-blades 1 to 3 mm. wide, flat or somewhat canaliculate; head 1 to 2 cm. long, the 3 or 4 spikes approximate, the lateral pistillate, suborbicular, 4 mm. long, with 3 to 10 widely spreading perigynia, the upper long-tapering and staminate at base; scales ovate-orbicular, brownish, hyaline-margined all around, the center lighter-colored, the midvein not sharply defined; perigynia oblong-ovoid, straw-color or light-brownish, plump, 2.5 to 3 mm. long, sparingly serrulate on the upper margins, abruptly beaked, the beak with very short teeth.—Boggy meadows, northern Sierra Nevada from Plumas Co. to Siskiyou Co.; n. to B. C., e. to Newf., s. to Mex.

25. **C. ormántha** Mkze. Culms 1.5 to 4 dm. high, slender but rather stiff; leaf-blades slightly canaliculate, 1.5 to 2 mm. wide; head 2 to 6 cm. long; spikes 3 or 4, the lateral suborbicular, 6 to 8 mm. wide, with 2 to 12 widely radiating perigynia; perigynia rounded at base, tapering into the bidentate beak more than ½ length of body, the teeth short.—Boggy places in the mountains, mostly 4000 to 6000 ft.: San Bernardino Mts.; Sierra Nevada from Tulare Co. to Tehama Co.; also in Ore.

26. **C. phyllománica** W. Boott. Culms 2.5 to 6 dm. high, smooth or nearly so; leaf-blades flat, 1.75 to 2.75 mm. wide; head 1.5 to 3.5 cm. long; spikes 3 or 4, the lateral suborbicular, 7 mm. wide with 8 to 15 widely spreading

perigynia; perigynia round-truncate at base, tapering into a beak scarcely ½ length of body, the teeth short.—Swampy places near the coast, Mendocino Co. to Del Norte Co.; n. to Alas.

27. **C. angústior** Mkze. Culms very slender but strict, 1 to 6 dm. high, somewhat roughened above; leaf-blades 1 to 2 mm. wide, flat, or canaliculate; spikes 2 to 5, approximate, 4 to 6 mm. long, with 3 to 15 perigynia, the terminal long-clavate, the lateral rounded at base; scales as long as body of perigynia, ovate; perigynia 2.5 to 3.5 mm. long, yellowish-brown, impressed-nerved ventrally, tapering into a bidentate beak more than ½ length of body.—Boggy places, rare: Eldorado Co.; Humboldt Co.; n. to Wash., e. to Newf.

28. **C. illòta** Bailey. Sheep Sedge. Culms 1 to 3.5 dm. high, slender but strict; leaf-blades 1.5 to 3 mm. wide; scales broadly ovate, obtuse, brownish-black; perigynia ovate, 3 mm. long, obscurely nerved, brownish-black, the beak ⅓ length of body, smooth or nearly so, emarginate.—High montane, Sierra Nevada from Tulare Co. to Eldorado Co.; n. to Wash., e. to Col.

Sect. 11. Deweyanae Tuckerm. Densely cespitose. Culms triangular. Sheaths not red-dotted or cross-rugulose. Spikes 3 to 8, gynaecandrous, pistillate or rarely staminate, simple. Lower one or two bracts often conspicuous. Perigynia plano-convex, light- or yellowish-green, appressed, the body ovate- or linear-oblong, strongly spongy at base, only upper half sharp-edged, round-tapering at base, nerved on the outer face, nerved or nerveless on the inner face, the beak bidentulate to deeply bidentate. Achenes lenticular. Stigmas 2.

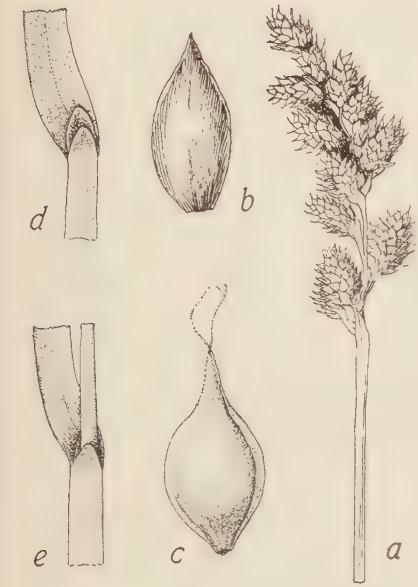
173. Carex bolanderi Olney: *a*, infl. x 1; *b*, scale x 7½; *c*, perigy. x 7½.

29. **C. leptópoda** Mkze. Culms erect, 2 to 8 dm. high, roughened beneath head; leaf-blades 2.5 to 5 mm. wide; spikes ovoid-oblong or linear-oblong, with 6 to 18 perigynia; scales not reddish-brown tinged, mostly cuspidate, shorter than the bodies of the ovate-lanceolate perigynia.—Damp woods: Sierra Nevada from Tulare Co. to Shasta Co., 4000 to 8000 ft.; Coast Ranges from Santa Cruz Co. to Trinity Co., 50 to 3000 ft.; n. to B. C., e. to Ida.

30. **C. bolánderi** Olney. Wood Sedge. Fig. 173. Culms 1.5 to 9 dm. high, little roughened beneath head; leaf-blades 2.5 to 5 mm. wide; spikes linear-oblong or linear, with 8 to 30 perigynia; scales usually reddish-brown tinged, mostly acute or mucronate, concealing the bodies of the lanceolate perigynia.—Widely distributed in the mountain ranges, mostly at lower altitudes, 100 to 2000 (or 6000) ft.: San Bernardino Mts.; Coast Ranges; Sierra Nevada; n. to B. C., e. to N. Mex. and Mont.

Sect. 12. Ovales Kunth. Densely cespitose or (rarely) with short-prolonged rootstocks. Culms triangular. Opaque part of leaf-sheaths not red-dotted or cross-rugulose, but sometimes green-striate. Spikes 2 or 3 up to 30, with several to many perigynia, the terminal gynaecandrous, the lateral pistillate or gynaecandrous, simple, the inflorescence capitate to moniliform. Perigynia scale-like or flat (except where distended by achene) to thick and plano-convex, the body subulate to reniform, narrowly to broadly wing-margined, appressed or ascending or spreading, little corky-thickened at base, prominently beaked, the beak bidentate, or obliquely cut, often becoming bidentulate, usually serrulate on the margins. Achenes lenticular. Stigmas 2.

31. **C. fèta** Bailey. Western Sedge. Fig. 174. Culms 5 to 12 dm. high, smooth; leaf-blades 2.5 to 4 mm. wide; head 2 to 8 cm. long, the spikes 5 to 15, greenish, aggregated or more or less separate, 6 to 10 mm. long, the perigynia appressed, or spreading in age; bracts inconspicuous; scales ovate, greenish, acute; perigynia plano-convex, thickish, ovate, greenish, 3 to 3.5 mm. long, nearly nerveless ventrally, contracted into a flat beak less than ½ length of body.—Foothills and mountains, 100 to 7800 ft.: coastal S. Cal.; Coast Ranges; Sierra Nevada; n. to B. C.



174. Carex feta Bailey; *a*, infl. x 1; *b*, scale x 8; *c*, perigy. x 8; *d*, sheath x 2; *e*, culm and sheath x 2.

32. **C. frácta** Mkze. Culms 5 to 12 dm. high; leaf-blades 3 to 6 mm. wide; head 2.5 to 7.5 cm. long, the spikes 7 to 15, aggregated or the lower slightly separate, short-oblong or obovoid, 8 to 12 mm. long, the perigynia appressed or ascending in age; bracts inconspicuous; scales lance-ovate, acuminate or short-cuspidate, shorter than the perigynia; perigynia lance-ovate, thickish over achene, 3 to 4.5 mm. long, strongly nerved ventrally, narrowly margined, serrulate above; beak about length of body.—Mts. of S. Cal.; Sierra Nevada; North Coast Ranges; alt. 4000 to 7000 ft.; n. to Wash.

33. **C. stráminifórmis** Bailey. Leaf-blades 2 to 3.5 mm. wide; head 1.5 to 2.5 cm. long, containing 3 to 6 spikes, 6 to 10 mm. long with many spreading-ascending perigynia; scales ovate-lanceolate, acute, reddish-brown; perigynia broadly ovate, strongly winged, nerveless or nearly so ventrally, abruptly beaked, the beak ⅓ length of body.—High summits of the Sierra Nevada, 8000 to 11,700 ft.; n. to Wash.

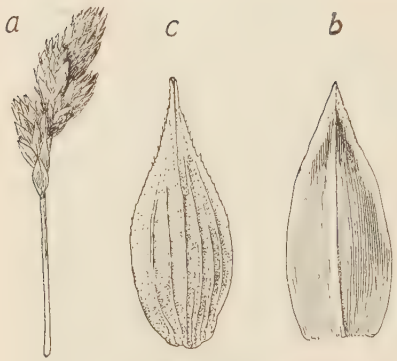
34. **C. múlticostàta** Mkze. Leaf-blades 2.5 to 6 mm. wide; spikes about 10, 8 to 16 mm. long; scales ovate, obtuse to acute, reddish-brown; perigynia appressed, ovate, several-nerved ventrally, winged to the rounded base, abruptly contracted into the beak 1 mm. long.—Mts. of S. Cal.; Sierra Nevada in Nevada Co.; rare.

35. **C. subfúsca** W. Boott. Culms 2 to 6.5 dm. high, smooth; leaf-blades 1.5 to 3 mm. wide; head oblong or ovoid, 1 to 2 cm. long, the spikes 4 to 12, well defined but closely aggregated, ovoid or oblong, 4 to 10 mm. long, rounded at apex, rounded or somewhat tapering at base, the perigynia appressed-ascending; scales ovate, acute, brownish; perigynia ovate, plano-convex, thickish, winged to the rounded base, serrulate above, faintly nerved ventrally, contracted into beak ½ length of body or more.—High montane in coastal S. Cal. and in the Sierra Nevada, 4000 to 8000 ft.; Coast Ranges from Monterey Co. to Siskiyou Co., mostly 500 to 2500 ft.; n. to Ore., e. to Ariz.

36. **C. pratícola** Rydb. Culms 2 to 7 dm. high, roughened beneath head; leaf-blades 1 to 3.5 mm. wide, flat; spikes 2 to 7, elliptic, 6 to 16 mm. long, the upper contiguous, the lower remote; bracts except lowest not developed; scales ovate, acutish, brownish tinged, shining; perigynia concealed by scales, ovate-lanceolate, 4.5 to 6.5 mm. long, narrowly winged, nearly nerveless ventrally, tapering to a short hyaline-tipped beak ⅓ length of body.—Meadows and open woods, Humboldt Co.; n. to arctic Am.

37. **C. tràcyi** Mkze. Head stiff, narrow, 1.5 to 4 cm. long, the spikes 4 to 7, ovoid or short-oblong, 7 to 15 mm. long; scales ovate, acute, covering perigynia, brownish-red; perigynia ovate, 4 to 5 mm. long, winged to the rounded base, serrulate above, strongly nerved dorsally and ventrally, abruptly beaked, the beak obliquely cut dorsally, at length bidentulate, dark reddish-brown at tip, shorter than body.—Humboldt Co.; n. to B. C.

38. **C. phaèocéphala** Piper. Fig. 175. Spikes 2 to 5 (rarely 7), 6 to 12 mm. long, forming a head 12 to 25 mm. long; lowest bract occasionally developed; scales ovate, acute, dark brownish, covering perigynia; perigynia 4.5 mm. long, obscurely nerved ventrally, contracted into a beak about 1 mm.



175. Carex phaeocephala Piper; *a*, infl. x 1; *b*, scale x 7; *c*, perigy. x 7.

long. — High peaks of the Sierra Nevada from Mt. Whitney to Mt. Shasta; n. to Alas., e. to Col.

39. **C. léporinélla** Mkze. Spikes 3 to 8, narrowly oblong-oval, 6 to 15 mm. long, forming a head 1.5 to 3 cm. long; lowest bract occasionally somewhat developed; scales ovate, acute, reddish-brown, covering perigynia; perigynia 4 mm. long, few-nerved ventrally, tapering into a beak 1 mm. long. — High summits, cent. Sierra Nevada from Mariposa Co. to Placer Co.; n. to Wash.

40. **C. dàvyi** Mkze. Culms 2.5 to 3.5 dm. high, smooth, slender; leaf-blades 1.5 to 2.5 mm. wide; head about 2.5 cm. long, the spikes oblong-obovoid, 12 to 18 mm. long; bracts not developed; scales oblong-ovate, very obtuse, chestnut; perigynia thin, 7.5 mm. long, striate dorsally and ventrally, narrowly margined to base and serrulate to middle, the sharply bidentate beak not differentiated from body.—High Sierra Nevada from Placer Co. to Tulare Co., 6000 to 10,000 ft.

41. **C. specifica** Bailey. Culms 2.5 to 8 dm. high, smooth, stiff; leaf-blades 2 to 5 mm. wide; head globose, 1.5 to 4 cm. long, the spikes oblong-ovoid, 6 to 9 mm. long; bracts little developed; scales lance-ovate, acute, reddish-brown; perigynia thin, plano-convex, 6 mm. long, several to many-nerved on both faces, narrowly winged to base, serrulate above, tapering into a bidentate beak ⅓ length of body.—Sierra Nevada from Eldorado Co. to Tulare Co., 6500 to 8000 ft.

42. **C. uniláteràlis** Mkze. Culms 2 to 9 dm. high, slender, leaf-blades 2 to 4 mm. wide; spikes 5 to 20, ovoid, 5 mm. long, densely aggregated into an ovoid head 1 to 3 cm. long; lowest 2 or 3 bracts dilated and strongly brownish hyaline margined at base; scales ovate, strongly cuspidate, reddish; perigynia appressed, ovate-lanceolate, thin, 4 to 5 mm. long, wing-margined, serrulate above, tapering into a short flat beak, serrulate nearly to apex.—Wet meadows and copses, Humboldt Co.; n. to B. C.

43. **C. áthrostàchya** Olney. Fig. 176. Culms 1 to 9 dm. high, slender; leaf-blades 1.5 to 4 mm. wide; spikes 4 to 20, ovoid, 4 to 10 mm. long, densely aggregated into an ovoid head 1 to 3 cm. long; lowest 2 or 3 bracts dilated and strongly brownish hyaline-margined at base, spreading; scales ovate, shorter than the perigynia, acute or short-cuspidate, brown; perigynia ascending, ovate-lanceolate, thin, 3 to 4.5 mm. long, wing-margined, serrulate above, tapering into a beak 1 mm. long, the tip slender, terete.—Wet meadows and copses: San Bernardino Mts.; Sierra Nevada from Tulare Co. to Lassen Co.; North Coast Ranges from Mendocino Co. to Siskiyou Co.; n. to Alas., e. to Col.

44. **C. festivélla** Mkze. Culms 3 to 10 dm. high; leaf-blades 2 to 6 mm. wide; spikes 5 to 20, ovoid, 5 to 12 mm. long, densely aggregated into a head 12 to 25 mm. long; bracts inconspicuous; scales ovate, obtuse to acutish, dark chestnut to brownish-black; perigynia ovate, appressed, lightly nerved ventrally, the beak ½ length of body.—High montane, 7000 to 10,000 ft.: Sierra Nevada from Eldorado Co. to Tulare Co.; White Mts.; n. to Wash., e. to Col.

176. Carex athrostachya Olney; *a*, infl. x 1; *b*, scale x 8; *c*, perigy. x 8.

45. **C. nubícola** Mkze. Culms 1 to 4 dm. high; leaf-blades 1.5 to 4 mm. wide; head 9 to 18 mm. long, the 4 to 7 densely aggregated ovoid or subglobose spikes 5 to 9 mm. long, the perigynia ascending with spreading beaks; bracts inconspicuous; scales ovate, acute, blackish; perigynia ovate, strongly winged, abruptly contracted into a beak ½ length of body.—Summits of high mountains: Mt. Dana (our only known locality); n. to Alb., e. to Col.

46. **C. páchystàchya** Cham. Culms 3 to 10 dm. high;leaf-blades 2 to 4 mm. wide; spikes 4 to 8, densely aggregated or more or less separate, ovoid or suborbicular, 5 to 8 mm. long, with 10 to 30 at length spreading perigynia; scales ovate, dark colored; perigynia ovate, 3.5 to 5 mm. long, olive-brown, the beak ½ length of body.—Humboldt Co. to Siskiyou Co.; n. to the Aleutian Isls., e. to Col. It has a wide altitudinal as well as a wide geographical range, and individual plants vary very considerably.

177. Carex abrupta Mkze.; *a*, infl. x 1; *b*, scale x 7½; *c*, perigy. x 7½.

47. **C. abrúpta** Mkze. Fig. 177. Culms 4 to 6 dm. high; leaf-blades 1.5 to 2.5 mm. wide; head suborbicular, 9 to 17 mm. long, the 4 to 8 spikes ovoid, 5 to 8 mm. long, the perigynia ascending; scales ovate, obtuse, chestnut-brown; perigynia oblong-lanceolate, 3.75 to 4 mm. long, soon brownish tinged, abruptly contracted into the beak.—High montane, 5600 to 10,000 ft., mts. of S. Cal. and Sierra Nevada; seacoast, Humboldt Co.

48. **C. máriposàna** Bailey. Culms 2.5 to 6 dm. high; leaf-blades 2 to 3 mm. wide; head oblong or ovoid, 2 to 3.5 cm. long, the spikes 4 to 12, the upper approximate, the lower 1 to 3 slightly separate, oblong-ovoid, 8 to 12 mm. long, the perigynia closely appressed; scales ovate, acute; perigynia narrowly ovate, 5 mm. long, green or in age straw-colored, tapering into a beak ¼ length of body.—High montane, 5000 to 9000 ft.: Sierra Nevada from Shasta Co. to Tulare Co.; San Gabriel Mts. and San Bernardino Mts.

49. **C. íntegra** Mkze. Fig. 178. Culms 1.5 to 3.5 dm. high, smooth; leaf-blades 1 to 2 mm. wide; head 1 to 2 cm. long, the spikes 4 to 8, densely aggregated, oblong-obovoid, 4 to 8 mm. long, the perigynia appressed-ascending; scales ovate, acute, dark chestnut; perigynia nerveless or nearly so ventrally, narrowly margined, the beak ½ length of body or more.—Montane, Sierra Nevada from Tulare Co. to Siskiyou Co., 4000 to 8000 ft.; n. to Ore.

178. Carex integra Mkze.; *a*, infl. x 1; *b*, scale x 7; *c*, perigy. x 7.

50. **C. téneraefórmis** Mkze. Culms 3 to 4.5 dm. high, very slender, smooth or nearly so; leaf-blades averaging 1.5 mm. wide; head 1.5 to 2.5 cm. long, the spikes 5 to 8, readily distinguishable and more or less separate, 3.5 to 6 mm. long, the perigynia loosely appressed; scales ovate, acute, light brown; perigynia plano-convex, thickish, nerveless or nearly so ventrally, tapering into the slender beak 1 mm. long.—Middle altitudes, 4000 to 8000 ft.: Sierra Nevada from Butte Co. to Tulare Co.; Lake Co.; San Gabriel Mts.

51. **C. ampléctens** Mkze. Fig. 179. Culms stiff, 5 to 8 dm. high; leaf-blades 2.5 to 4 mm. wide; head 2.5 to 5 cm. long, the 6 to 12 spikes approximate, oblong-ovoid, 7 to 15 mm. long, the perigynia closely appressed; scales ovate, acute or short-cuspidate, greenish; perigynia ovate, 3.5 to 4 mm. long, light green, narrowly margined, several-nerved on both faces, contracted into a beak ½ length of body or less.—Sierra Nevada from Shasta Co. to Tulare Co., 4000 to 9000 ft.

179. Carex amplectens Mkze.; *a*, infl. x 1; *b*, scale x 7½; *c*, perigy. x 7½.

52. **C. harfórdii** Mkze. HARFORD SEDGE. Culms 2.5 to 8 dm. high; leaf-blades 2.5 to 4.5 mm. wide; head 1.5 to 2.5 cm. long, the 10 to 20 spikes closely aggregated, ovoid, 6 to 10 mm. long, the perigynia appressed-ascending; scales ovate; perigynia narrowly ovate, 3.5 to 4.25 mm. long, tapering into a beak ¼ length of body.—Coastal counties from Humboldt Co. to San Mateo Co.

53. **C. móntereyénsis** Mkze. Culms 8 to 10 dm. high; leaf-blades 2.5 to 3 mm. wide; head 1.5 to 2.5 cm. long, the 8 to 12 spikes closely aggregated, ovoid, 6 to 9 mm. long, the perigynia ascending; scales narrowly ovate; perigynia ovate, 3.25 mm. long, tapering into a beak ½ length of body.—Pine forests, Pacific Grove, Monterey Co.

54. **C. sub-bracteáta** Mkze. Head 1.5 to 2.5 cm. long, the spikes 5 to 10, ovoid, 6 to 10 mm. long, the perigynia 10 to 20, appressed or in age appressed-ascending; one or more lower bracts conspicuous; scales ovate, obtuse or acutish, reddish-brown; perigynia narrowly ovate, 3.5 to 4.5 mm. long, thick, plano-convex, contracted into a beak ⅓ length of body.—Coast Ranges from Humboldt Co. to Santa Barbara Co.

55. **C. gracílior** Mkze. Head 12 to 20 mm. long, the spikes 3 to 6, the lower 1 or 2 more or less separate, suborbicular, 5 to 8 mm. long, the 4 to 12 perigynia ascending or spreading-ascending with conspicuous beaks; scales ovate, obtuse or acutish, chestnut-brown; perigynia narrowly ovate, 3.5 to 4.5 mm. long, thick, plano-convex, contracted into a beak ⅓ length of body.—Coast Ranges from Mendocino Co. to San Mateo Co.

56. **C. pachycárpa** Mkze. Culms 3 to 6 dm. high, smooth; leaf-blades 2.5 to 4 mm. wide, 1 to 2 dm. long; head 1.5 to 2.5 cm. long, the spikes 5 to 8, closely aggregated, 6 to 10 mm. long, the 10 to 20 perigynia appressed; scales ovate, acute, light reddish-brown; perigynia ovate, plano-convex, thick, 5 mm. long, faintly many-striate ventrally, the beak ½ length of body.—Montane in the Sierra Nevada from Tulare Co. to Siskiyou Co., 5000 to 9000 ft.; Humboldt Co.; n. to Ore.

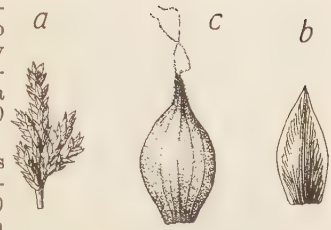
57. **C. paucifrúctus** Mkze. Culms 1 to 2.5 dm. high; leaf-blades 1.5 to 3 mm. wide, 3 to 7 cm. long; head 1 to 2 cm. long, the spikes 4 to 8, aggregated, 6 to 9 mm. long, the perigynia appressed or appressed-ascending; scales ovate, chestnut; perigynia 4 mm. long, ovate, thick, strongly plano-convex, nerveless ventrally, tapering into a beak ⅓ length of body.—Sierra Nevada in Sierra and Eldorado Cos., 6000 to 7000 ft.

SECT. 13. CANESCENTES Fries. Cespitose, some species with slender stolons. Culms triangular. Sheaths not cross rugulose. Spikes 1 to 10, with few to many perigynia, simple, the terminal gynaecandrous, the lateral pistillate or gynaecandrous, or rarely all androgynous. Bracts inconspicuous. Perigynia plano- or bi-convex, white-puncticulate, lanceolate, ovoid, oval or obovoid, appressed to spreading, beakless to prominently beaked, more or less nerved on both sides, not winged or margined, but acute-angled above, nearly or entirely filled by the lenticular achene. Stigmas 2.

58. **C. dispérma** Dewey. SOFT SEDGE. Culms very weak, 1.5 to 6 dm. high; leaf-blades 0.75 to 2 mm. wide, flaccid; spikes distant or upper aggregated, with 1 to 5 ascending perigynia and 1 or 2 staminate flowers; scales shorter than perigynia, ovate-triangular, sharp-pointed; perigynia ovoid-elliptic, 2 mm. long, finely nerved, abruptly beaked, the beak smooth, 0.25 mm. long.—Boggy spots, Sierra Nevada from Tulare Co. to Mono Co., chiefly on the e. side; n. to Alas., e. to Newf.; n. Eurasia.

59. **C. canéscens** L. SILVER SEDGE. Fig. 180. Culms 1 to 8 dm. high; leaf-blades glaucous, flat, 2 to 4 mm. wide; spikes 4 to 9, 3 to 12 mm. long;

scales shorter than perigynia, ovate, sharp-pointed; perigynia appressed-ascending, 1.8 to 3 mm. long, faintly few-nerved, minutely beaked, the beak with margins minutely serrulate. — Swamps and bogs, higher Sierra Nevada from Tulare Co. to Placer Co., 5000 to 9000 ft.; n. to Alas., e. to Va.



180. Carex canescens L.; *a*, infl. x 1; *b*, scale x 8; *c*, perigy. x 8.

60. **C. árcta** Boott. CLUSTER SEDGE. Culms 1.5 to 8 dm. high, very rough above; leaf-blades 2 to 4 mm. wide; spikes 5 to 15, 5 to 10 mm. long, aggregated; scales shorter than perigynia, ovate, obtusish to short-cuspidate; perigynia ascending or somewhat spreading, ovate, 2 to 3 mm. long, lightly nerved at base ventrally, rounded at base, the beak shallowly bidentate.—Swamps and wet woods, Humboldt Co.; n. to B. C., e. to N. B.

SECT. 14. POLYTRICHOIDEAE Tuckerm. Densely tufted. Culms slender. Leaf-blades narrow. Spike solitary, linear, androgynous, bractless. Rachis straight, not dilated. Perigynia appressed, membranaceous, the upper part empty, oblong-elliptic, many-nerved, not 2-ribbed, compressed-triangular, beakless. Achenes triangular, the sides concave. Stigmas 3, short.

61. **C. leptálea** Wahl. Culms 1.5 to 6 dm. high; leaf-blades 0.5 to 1.25 mm. wide; spike 4 to 15 mm. long; pistillate scales ovate, obtuse to short-pointed, ½ length of perigynia; perigynia 1 to 10, 2.5 to 4.5 mm. long, more or less strongly overlapping, round or somewhat flattened in cross-section.—Bogs and wet meadows, Humboldt Co.; n. to Alas., e. to the Atlantic.

SECT. 15. FIRMICULMES Kük. Culms wiry, aphyllopodic, the leaf-blades often rudimentary at flowering time. Spike one, androgynous, the staminate part in age short-peduncled, the pistillate loosely few-flowered. Scales more or less chartaceous. Perigynia 1 to several, obtusely triangular, smooth, 2-keeled, but otherwise nerveless, tapering at the base, very minutely beaked, the orifice truncate. Achenes triangular with nearly flat sides, closely enveloped by the perigynia, apiculate-tipped, constricted at base. Stigmas 3, elongated.

181. Carex multicaulis Bailey; *a*, infl. x 1; *b*, scale x 4; *c*, perigy. x 4.

62. **C. multicaúlis** Bailey. Fig. 181. Culms 2 to 6 dm. high, deep green; leaves with well developed blades 1 or 2 to a culm; inflorescence consisting of a terminal staminate part and of 2 to several perigynia in the axils of long (the lower) or short (the upper) awned scales, these enlarged and white hyaline at base; staminate scales very obtuse, broadly white hyaline margined; perigynia oblong-obovoid, 5 to 7 mm. long.—Dry soil, coastal S. Cal., 3500 to 6000 ft.: Sierra Nevada from Tulare Co. to Shasta Co., 4000 to 6000 ft.; Coast Ranges from Monterey Co. to Siskiyou Co., 100 to 4000 ft.; n. to Ore.

63. **C. géyeri** Boott. ELK-GRASS. Culms 1 to 4 dm. high; leaves with well-developed blades usually 2 to a culm, the blades thick, developing after flowering; inflorescence of the terminal staminate part with oblong-ovate striate obtusish straw-colored scales; perigynia 2 or 3, the lower in the axils of short-awned scales, the upper in the axils of obtusish or acutish straw-colored scales; perigynia appressed-ascending, oblong, 6 mm. long. —Dry mountain sides and open woods, Siskiyou Co.; n. to Alb., e. to Col.

SECT. 16. FILIFOLIAE Tuckerm. Densely cespitose. Leaf-blades filiform or narrow. Spike solitary, linear or linear-oblong, androgynous, densely flowered, bractless. Perigynia more or less triangular, nerveless except for the 2 lateral ribs, submembranaceous, not stipitate, not inflated, puberulent or pubescent, beaked or nearly beakless, hyaline-tipped and obliquely cut at apex. Achenes triangular, apiculate. Stigmas 3.

64. **C. exsérta** Mkze. SHORT-HAIR. Fig. 182. Culms very slender and wiry, 5 to 25 cm. high; spike 7 to 15 mm. long, the pistillate part with 2 to 12

182. Carex exserta Mkze.; *a*, habit x ⅔; *b*, scale x 3; *c*, perigy. x 3.

ascending perigynia, the pistillate scales orbicular-ovate, obtuse, dull reddish brown with hyaline margins; perigynia obovoid, 2.5 mm. long, essentially beakless.—Dry places in the mountains, 4000 to 11,000 ft.: San Bernardino Mts.; White Mts.; Sierra Nevada from Tulare Co. to Eldorado Co.; n. to s. Ore. Forms a large part of the "short-hair meadows" in the Sierra Nevada and readily eaten by stock.

SECT. 17. SCIRPINAE Tuckerm. Rootstocks creeping. Culms leafy below. Leaf-blades narrow. Spikes usually 1, linear, staminate or pistillate, many-flowered, normally with an empty scarcely sheathing squamiform bract a short distance below the spike. Perigynia triangular or flattened-triangular, membranaceous, 2-keeled, pubescent or puberulent, tapering at base, constricted at apex into the short cylindric entire or bidentate beak. Achenes triangular with flat sides, sessile, apiculate. Stigmas 3, short.

65. **C. gigas** (Holm) Mkze. Rootstocks densely matted; culms 3 to 4.5 dm. high; leaves 5 to 10, the blades 2.5 mm. wide; pistillate spike 1.5 to 2.5 cm. long, often with a second smaller peduncled spike; scales oblong-ovate, brownish, covering perigynia; perigynia numerous, black, 3 mm. long, oval, flattish, rounded at apex, the beak 0.5 mm. long, bidentate.—Siskiyou Co., 6800 to 8000 ft.; not otherwise known.

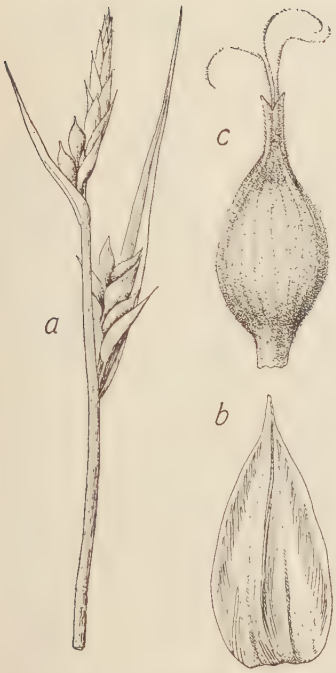
SECT. 18. MONTANAE Fries. Culms slender, leafy at base. Leaf-blades narrow, rough above. Terminal spike linear, normally staminate. Lateral spikes 1 to 5, small, pistillate or sometimes androgynous, subglobose to oblong, closely few to many-flowered, approximate and sessile or short peduncled, or in some species basal and long-peduncled. Lowest bract squamiform or leaflet-like, sheathless or sub-sheathing. Scales often reddish-brown tinged, acute to cuspidate. Perigynia membranaceous, ascending, the body pubescent at least at base of beak, obovoid to elliptic, triangular or round-triangular in cross-section, 2-keeled, strongly stipitate at base, abruptly contracted into a cylindric emarginate to deeply bidentate hyaline-tipped beak. Achenes normally triangular, the sides convex, closely enveloped, short-apiculate. Stigmas normally 3, long.

66. **C. inops** Bailey. Fig. 183. Strongly stoloniferous, the culms 2 to 3.5 dm. high, roughened above, reddened and fibrillose at base; leaf-blades 1.5 to 2.5 mm. wide, very rough above; staminate spike 1.5 to 2.5 cm. long, sessile or short-peduncled; pistillate spikes 1 to 3, approximate or more or less separate, sessile or short-peduncled, with 4 to 10 ascending perigynia; scales ovate, sharp-pointed; perigynia 3.5 mm. long, nearly orbicular in cross-section, the beak 0.75 to 1.5 mm. long.—Dry soil, Siskiyou Co.; n. to Wash.

67. **C. globòsa** Boott. Stoloniferous, the culms 1.5 to 3.5 dm. high, rough above; leaf-blades 1.5 to 2.5 mm. wide; staminate spike short-peduncled, 1 to 2 cm. long; pistillate spikes 5 to 10 mm. long, with 4 to 10 ascending perigynia; lower bract shorter than to exceeding inflorescence; perigynia 5 mm. long, the beak 0.75 to 1.25 mm. long, strongly bidentate.—Coastal counties from San Diego Co. to Sonoma Co.

68. **C. brainérdii** Mkze. Fig. 184. Culms up to 15 cm. high; leaf-blades 1.5 to 3 mm. wide, much roughened; pistillate spikes 4 to 6, 1 to 4-flowered; lower bract of non-basal spikes exceeding inflorescence, chestnut-tinged, more or less strongly sheathing; perigynia 4.5 mm. long, the beak 1 mm. long.—Sierra Nevada from Mariposa Co. to Siskiyou Co., 4000 to 5000 ft.; also in s. Ore.

183. Carex inops Bailey; a, infl. x 1; *b*, scale x 8; *c*, perigy. x 8.



184. Carex brainerdii Mkze.; *a*, infl. x 2; *b*, scale x 7½; *c*, perigy. x 7½.

69. **C. brévipes** W. Boott. In dense clumps from stout matted rootstocks, the culms from very short to 18 cm. high; leaf-blades 1.5 to 2.5 mm. wide; staminate spike short-peduncled or sessile, 4 to 12 mm. long; pistillate spikes 3 to 5, usually 10 to 20-flowered, the upper 1 or 2 approximate, sessile to strongly peduncled; scales ovate; perigynia with body little longer than wide.—Montane, 4000 to 7000 ft.: Sierra Nevada from Placer Co. to Tulare Co.; San Gabriel Mts.; n. to Wash.

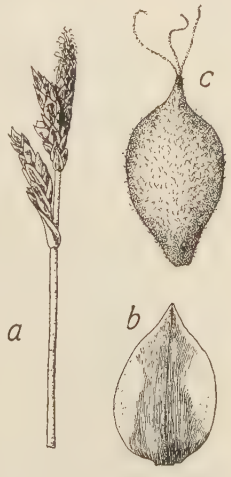
70. **C. róssii** Boott. Densely cespitose; culms wiry, 5 to 25 cm. high; leaf-blades 1 to 2.5 mm. wide; staminate spike usually conspicuous, 3 to 10 mm. long; pistillate spikes globose to short-oblong, 3 to 5 mm. long, 2 to 12-flowered, the upper contiguous; scales ovate, sharp-pointed; perigynia nearly globose in cross section.—Sierra Nevada from Mariposa Co. to Shasta Co., thence w. to Humboldt Co.; n. to Alas., e. to Mich. The most widely distributed and abundant species of the group in the w. U. S., but sparingly collected with us.

71. **C. brevicaúlis** Mkze. Stoloniferous, the culms 5 to 10 cm. high, very rough; leaf-blades 1.5 to 3.5 mm. wide; staminate spike short-peduncled, few-flowered, 6 to 9 mm. long; lateral spikes 2 to 4, 4 to 6 mm. long, the upper 1 or 2 sessile and approximate; scales ovate, acute to short-cuspidate; perigynia about 4 mm. long, the body globose, 2.25 mm. wide, the beak 1 mm. long.—Along the coast from Monterey Co. to Del Norte Co.; n. to B. C.

Sect. 19. Digitatae Fries. Culms slender, leafy at base. Leaf-blades narrow, the sheaths usually strongly purplish. Terminal spike linear, staminate. Lateral spikes 1 to 5, approximate or separate or sometimes basal, oblong to linear, 5- to 20-flowered in few ranks, the peduncles included or exserted. Bracts sheathing, more or less strongly purplish-tinged, subspathaceous, the blade absent to rudimentary. Pistillate scales strongly purplish or reddish-brown tinged. Perigynia membranaceous, appressed, oblong-obovoid, pubescent to glabrate, triangular, long-tapering to the stipitate base, abruptly contracted into the minute beak, the orifice entire or nearly so. Achenes triangular, closely enveloped. Stigmas 3, early deciduous.

72. **C. concínnoides** Mkze. Fig. 185. Strongly stoloniferous, the culms 1.5 to 3.5 dm. high, smooth; leaf-blades light green, 2 to 4 mm. wide; staminate spike nearly sessile, 8 to 22 mm. long; pistillate spikes 1 or 2, approximate, rather closely 5 to 10-flowered, sessile or short-peduncled; scales narrowly ovate, sharp-pointed, ciliate; perigynia 2.5 to 3 mm. long, loosely pubescent, the beak 0.5 mm. long, wider and longer than the scales.—Dry soil, Mendocino Co.; n. to B. C., e. to Mont.

Sect 20. Bicolores Tuckerm. Stoloniferous. Culms central, slender, leafy toward base. Leaf-blades narrow. Basal sheaths light brown. Terminal spike linear, staminate or gynaecandrous. Lateral spikes 2 to 5, pistillate, rather closely few to many-flowered, in few ranks on erect exserted peduncles. Bracts sheathing, not colored or dark-auricled, the blades elongated, leaf-like. Scales reddish- or purplish-brown tinged. Perigynia ascending, broadly oval or ellipsoid, circular in cross section, nerved, glabrous,



185. Carex concinnoides Mkze.; *a*, infl. x 1; *b*, scale x 8; *c*, perigy. x 8.

186. Carex salinaeformis Mkze.; *a*, infl. x 1; *b*, scale x 7½; *c*, perigy. x 7½.

golden-yellow or white-pulverulent or straw-color at maturity, tapering or rounded at base, essentially beakless. Achenes lenticular, apiculate, closely enveloped. Stigmas 2.

73. **C. salinaefórmis** Mkze. Fig. 186. Culms 5 to 15 cm. high, smooth; leaf-blades 2 to 5 mm. wide; staminate spike 8 to 16 mm. long; pistillate spikes 3 or 4, the upper approximate, short-peduncled, the lower widely separate, long-peduncled, 6 to 12 mm. long, with 8 to 15 appressed-ascending perigynia; perigynia slightly constricted at apex.—Mendocino coast, not otherwise known.

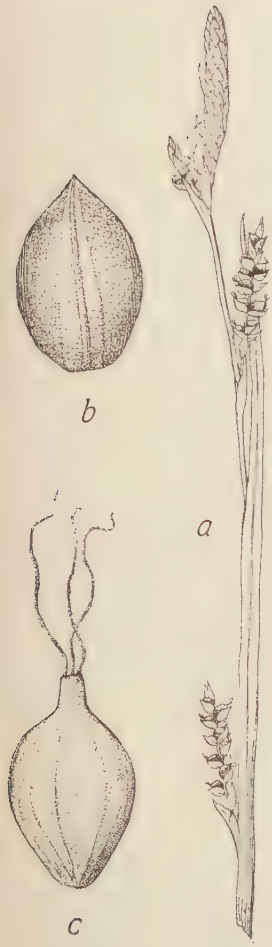
74. **C. hássei** Bailey. Culms 1.5 to 7 dm. high, usually much roughened above; leaf-blades 2 to 4 mm. wide; staminate spike 6 to 20 mm. long, often pistillate at apex; pistillate spikes 3 to 5, the upper approximate and short-peduncled, the lower long-peduncled, linear-oblong, 8 to 20 mm. long, with 6 to 20 ascending perigynia; perigynia obovoid, 2.5 to 3 mm. long; style becoming short-exserted and somewhat persistent.—River banks and wet rocks: San Gabriel Mts. and San Bernardino Mts.; Sierra Nevada from Tulare Co. to Siskiyou Co., 4000 to 5000 ft.; very local in the Coast Ranges; n. to Alas., e. to Lab.

75. **C. aúrea** Nutt. Golden Sedge. Culms 0.3 to 5.5 dm. high, smooth or somewhat roughened; leaf-blades 2 to 4 mm. wide; staminate spike 3 to 10 mm. long; pistillate spikes 3 to 5, the upper approximate and short-peduncled, the lower separate and often strongly peduncled, 4 to 20 mm. long, with 4 to 20 ascending perigynia; perigynia umbonate, 2 to 3 mm. long.—Wet places, high montane, 5000 to 9000 ft.: Sierra Nevada from Modoc Co. to Tulare Co.; occurring locally in the San Gabriel Mts. and San Bernardino Mts.; n. to Alas., e. to Newf.

Sect. 21. Paniceae Tuckerm. Stoloniferous. Culms central, slender. Basal sheaths brownish or purplish tinged. Terminal spike staminate, linear or linear-oblong. Lateral spikes 1 to 5, pistillate, loosely to rather closely several to many-flowered, in few or several ranks, on erect, exserted or included peduncles. Bracts sheathing, not colored or dark-auricled, the blades developed. Scales purplish- or reddish-brown tinged. Perigynia ascending or spreading, ovoid or obovoid, membranaceous, obtusely triangular, slightly inflated, glabrous, punctiulate, light or olive green, pointed or beaked, the orifice entire or nearly so. Achenes triangular, apiculate. Stigmas 3.

76. **C. lívida** (Wahl.) Willd. Rootstocks very slender; culms 1 to 6 dm. high, smooth, light brownish at base, phyllopodic; leaf-blades 0.5 to 3.5 mm. wide; staminate spike 1.5 to 2.5 cm. long; pistillate spikes 1 or 2, approximate, sessile or short-peduncled, 1 to 2 cm. long, closely 5 to 15-flowered; perigynia 3.5 to 4.5 mm. long, the body ellipsoid, glaucous, faintly nerved, exceeding the scales.—Sphagnum bogs, Mendocino Co.; n. to Alas., e. to Lab.

77. **C. californica** Bailey. Fig. 187. Rootstocks stout; culms 2 to 7 dm. high, smooth, reddish-purple at base, strongly aphyllopodic; culm-leaves 2 to 4, the blades 1.5 to 5 mm. wide, glandular-dotted beneath; staminate spike 1.5 to 3.5 cm. long; pistillate spikes 2 to 4, strongly separate, the upper short exsert-peduncled, the lower often nearly basal and long-exsert-peduncled,



187. Carex californica Bailey; *a*, infl. x 1; *b*, scale x 7½; *c*, perigy. x 7½.

linear-oblong, 1 to 3 cm. long, with 7 to 20 appressed perigynia; scales hispidulous; perigynia 3.5 to 4 mm. long, the body suborbicular, green, several-nerved, the beak 0.75 mm. long with slightly oblique orifice.—Meadows and prairies, Mendocino Co.; n. to Wash. Rare and local.

SECT. 22. LAXIFLORAE Kunth. Cespitose. Fertile culms mostly lateral, the sterile shoots leafy, conspicuous. Basal sheaths brownish or purplish-tinged. Terminal spike staminate, linear. Lateral spikes 2 to 5, pistillate or androgynous, loosely to closely few to many-flowered, in few to several ranks, on erect to drooping, included or exserted peduncles. Bracts sheathing, the sheaths green or purplish tinged, the blades leaf-like or sometimes reduced. Scales green with hyaline margins or more or less colored. Perigynia ascending, membranaceous, triangular, usually nerved, closely enveloping the achene, glabrous or hispidulous, tapering at the base, short-beaked or beakless, the orifice entire. Achenes triangular, apiculate. Stigmas 3.

78. **C. hendersònii** Bailey. Fig. 188. Culms 4 to 9 dm. high, sharply triangular, rough above; sterile shoots developing conspicuous culms; leaf-blades 3 to 15 mm. wide, spike 1.5 to 3 dm. long; pistillate spikes 2 to 4, erect, 12 to 25 mm. long, with 5 to 12 alternate ascending perigynia, the upper spikes approximate, the lower widely separate; scales broadly obovate, mucronate; perigynia narrowly obovoid, 5 to 6 mm. long, tapering into a straight scarcely differentiated beak.—Damp woods in the Coast Ranges from Sonoma Co. to Humboldt Co.; n. to B. C.

SECT. 23. TRIQUETRAE Carey. Cespitose, leafy toward base. Leaf-blades narrow, the sheaths not purplish tinged. Terminal spike linear, staminate. Lateral spikes 2 to 4, approximate or more or less separate or sometimes basal, 5- to 30-flowered in few ranks. Bracts sheathing, not purplish tinged, the lowest with a well-developed blade. Pistillate scales greenish or hyaline or reddish-brown tinged. Perigynia membranaceous, ascending, obovoid, short-pubescent or glabrous, triangular, tapering and more or less stipitate at base, abruptly contracted into the minute beak, the orifice obliquely cut, minutely bidentate. Achenes triangular, closely enveloped. Stigmas 3, early deciduous.

188. Carex hendersonii Bailey; *a*, infl. x ⅔; *b*, scale x 4; *c*, perigy. x 4.

79. **C. flaccifòlia** Mkze. Culms 6 to 9 dm. high; leaf-blades about 3 mm. wide; staminate spike 1 to 2.5 cm. long, short-pedúncled; pistillate spikes mostly 3, approximate or somewhat separate, sessile or short-peduncled, 1 to 2.5 cm. long, rather loosely 8- to 25-flowered; scales ovate, cuspidate; perigynia short-tapering at base, the beak 0.5 mm. long, bidentulate.—Dry plains in sw. Cal.

80. **C. whítneyi** Olney. Fig. 189. Culms 2.5 to 10 dm. high; leaf-blades 2.5 to 8 mm. wide; staminate spike peduncled, 5 to 30 mm. long; pistillate spikes 2 to 4, approximate or lower separate, erect, sessile or short-

189. Carex whitneyi Olney; *a*, infl. x 1; *b*, scale x 6; *c*, perigy. x 6.

peduncled, 7 to 30 mm. long, closely 5 to 30-flowered; scales ovate, acute or short-cuspidate; perigynia round-tapering at base.—Sierra Nevada from Tulare Co. to Plumas Co., 4000 to 7000 ft.; n. to Ore.

81. **C. gynodynama** Olney. Culms 2 to 9 dm. high, slender, brownish at base; leaf-blades 3 to 9 mm. wide; terminal spike usually staminate, 1 to 2 cm. long; lateral spikes 2 to 4, oblong-cylindric, 1 to 3.5 cm. long, closely 20 to 40-flowered, the upper approximate, usually overtopping the staminate spike, short-peduncled, the lower strongly separate, long-peduncled; scales ovate-orbicular, short-cuspidate or obtuse; perigynia ascending, the beak 0.75 mm. long.—Coast Ranges from San Mateo Co. to Humboldt Co.; n. to Ore.

82. **C. hirtíssima** W. Boott. Culms 3 to 6 dm. high, erect, purplish red at base; leaf-blades 3 to 7 mm. wide; terminal spike staminate or gynaecandrous, peduncled, 1.5 to 2.5 cm. long; pistillate spikes 2 or 3, linear, 1 to 2.5 cm. long, more or less strongly separate, the lower on long-exserted peduncles, closely flowered with 20 to 30 ascending perigynia; scales ovate or obovate, cuspidate or mucronate, the margins broad, white-hyaline; perigynia ascending, the conic beak 1 mm. long.—Sierra Nevada from Nevada Co. to Mariposa Co., 3700 to 7000 ft.; Lake Co. Rare and local.

83. **C. tríquetra** Boott. Fig. 190. Culms 3 to 6 dm. high, stiffish; leaf-blades 2.5 to 6 mm. wide, the sheaths cinnamon-brown tinged and purplish spotted ventrally; staminate spike 1 to 3 cm. long; lateral spikes 3 or 4, erect, the upper little exsert-peduncled, approximate, the lower 1 or 2 often widely separate and long exsert-peduncled, 1 to 4.5 cm. long, the 5 to 30 perigynia ascending; scales ovate, short-cuspidate, brownish copper-color; perigynia 4 to 4.5 mm. long, softly short-pubescent, light green, obscurely several-nerved, the beak 0.3 mm. long.—Dry hillsides below 2000 ft. from Santa Barbara Co. to San Diego Co.; L. Cal.

190. Carex triquetra Boott; *a*, infl. x 1; *b*, scale x 8; *c*, perigy. x 8.

SECT. 24. DEBILES Carey. Culms aphyllopodic, strongly purplish tinged at base, tufted, slender, leafy. Leaf-blades flat. Terminal spike normally staminate. Lateral spikes 2 to 5, elongate, narrowly linear, slender-peduncled, the lower often drooping. Bracts green-sheathing, the blades leaf-like. Perigynia appressed or ascending, lanceolate to ovoid, membranaceous, obsoletely nerved, rather closely enveloping the achene, tapering to a well-developed conic beak, obliquely cut at orifice and strongly hyaline-tipped, at length bidentate. Achenes triangular, apiculate. Stigmas 3.

84. **C. méndocinénsis** Olney. MENDOCINO SEDGE. Fig. 191. Culms 3 to 8 dm. high, much exceeding leaves; leaves minutely pubescent, the blades 1.75 to 4 mm. wide; staminate spike 2 to 3.5 cm. long; pistillate spikes 2 or 3, slender, erect, 1.5 to 4 cm.

191. Carex mendocinensis Olney; *a*, infl. x ⅔; *b*, scale x 5; *c*, perigy. x 5.

long, closely-flowered above, the 20 to 40 perigynia appressed-ascending; scales ovate, obtuse or short-cuspidate, cinnamon-brown; perigynia 3.5 to 5 mm. long, oblong-obovoid, somewhat flattened, lightly nerved, minutely puberulent, the beak 0.5 mm. long.—Along streams from Mendocino Co. to Humboldt Co.; n. to Ore.

SECT. 25. FRIGIDAE Fries. Culms phyllopodic, tufted, the leaves clustered near the base. Spikes staminate, pistillate, androgynous or gynaecandrous. Bracts green-sheathing, the blades developed or rudimentary. Scales dark-tinged, usually with light midvein and margins. Perigynia appressed or ascending, flat to flattened-triangular, not inflated, dark-tinged, beaked, the beak hyaline at orifice, more or less bidentate. Achenes triangular, short apiculate. Stigmas 3.

85. **C. lemmònii** W. Boott. Culms slender, 2 to 8 dm. high, smooth, exceeding leaves; leaf-blades 1.5 to 4 mm. wide, erect; staminate spike 6 to 25 mm. long, sessile or short-peduncled; pistillate spikes 2 to 4, linear-oblong, 0.5 to 2 cm. long, 5- to 30-flowered, the upper approximate, the lower separate and exsert-peduncled; perigynia with beak 1 mm. long, sparingly ciliate-serrulate.—High montane, 6000 to 8500 ft.: Sierra Nevada from Tehama Co. to Tulare Co.; San Bernardino Mts.

86. **C. luzulìna** Olney. Culms 1.5 to 9 dm. high; leaf-blades 3 to 8 mm. wide, stiff; spikes 4 to 8, the upper clustered, the lower widely separated, on long-exserted peduncles, the lateral pistillate, 7 to 20 mm. long, 6 to 9 mm. wide; perigynia 4 to 5 mm. long, contracted into the short or in age conspicuous, sparingly ciliate-serrulate dark purplish-tipped beak.—Sonoma Co. to Humboldt Co.; also s. Ore.

87. **C. ablàta** Bailey. Culms slender, smooth, 2.5 to 6 dm. high, much exceeding leaves; leaf-blades 3 to 4.5 mm. wide; spikes 3 to 7, the upper clustered and sessile or nearly so, the lower usually widely separate and on slender exserted peduncles, the terminal usually staminate, the lateral mostly pistillate, 8 to 30 mm. long; perigynia lanceolate, greenish, 3.5 to 5 mm. long, obscurely nerved, slightly ciliate-serrulate, rounded at base, the beak scarcely 1 mm. long, dark purplish-tipped.—Mountain meadows and bogs, Siskiyou Co.; n. to B. C., e. to Mont.

88. **C. lùzulaefòlia** W. Boott. Fig. 192. Culms 4 to 10 dm. high; leaf-blades 5 to 15 mm. wide; terminal spike peduncled, 1 to 2 cm. long, often with 1 or 2 sessile staminate spikes at its base; pistillate spikes 3 to 6, all or only the lower strongly exsert-peduncled, widely separate, the upper often equaling the staminate spikes, oblong-cylindric, 1.5 to 2.5 cm. long, the 20 to 50 perigynia appressed; perigynia 4 to 5.5 mm. long, oblong-ovate, the beak 1.5 to 2 mm. long.—High montane, 7000 to 9500 ft., Sierra Nevada from Shasta Co. to Tulare Co.

192. Carex luzulaefolia W. Boott; *a*, infl. x ½; *b*, scale x 2½; *c*, perigy. x 2½.

89. **C. fissurícola** Mkze. Culms 5 to 8 dm. high; leaf-blades 3 to 8 mm. wide; terminal spike sessile or short-peduncled, often slightly pistillate; lateral spikes 4 or 5, the upper contiguous and sessile or short-peduncled, the lower separate and strongly peduncled; perigynia narrowly ovate, 4.5 to 5 mm. long, abruptly beaked, the beak 1.5 mm. long.—Mountain meadows, 5500 to 10,000 ft., Sierra Nevada from Tulare Co. to Placer Co.; e. to Nev.

193. Carex amplifolia Boott; *a*, infl. x ⅔; *b*, scale x 5; *c*, perigy. x 5.

Sect. 26. Anomalae Carey. Culms stout, leafy. Leaf-blades broad, flat, glabrous, not septate-nodulose. Terminal spike staminate, linear. Lateral spikes pistillate, linear-cylindric, scattered, closely many-flowered in several rows. Bracts leaf-like, sheathless. Perigynia ascending or in age spreading, obovoid, small, olive green, tapering at base, triangular, slightly inflated, thin, abruptly beaked, the beak conic. Achenes triangular, apiculate, more or less closely enveloped. Stigmas 3.

90. **C. amplifòlia** Boott. Fig. 193. Long-stoloniferous, the culms 5 to 10 dm. high; leaf-blades 8 to 18 mm. wide, nearly smooth above; terminal spike 4 to 9 cm. long; pistillate spikes 3 to 6, the upper approximate, the lower more or less strongly separate, short-peduncled or nearly sessile, 3.5 to 14 cm. long; scales pointed; perigynia 3 mm. long, glabrous, nerveless except for keels, long-beaked, the beak often excurved. —Wet soil, Sierra Nevada from Tulare Co. to Butte Co., 4000 to 8000 ft.; Coast Ranges from San Mateo Co. to Siskiyou Co., 1500 to 4000 ft.; n. to B. C. and Ida.

Sect. 27. Atratae Kunth. Culms aphyllopodic or phyllopodic. Terminal spike gynaecandrous or staminate, the lateral 1 to 10 pistillate or with a few staminate flowers at base, from sessile, erect and closely approximate to long-peduncled, nodding and distant. Bracts sheathless or nearly so, dark-colored at the base, the blades short. Scales usually dark-tinged. Perigynia membranaceous or more or less coriaceous, straw-colored or greenish, often strongly dark-tinged, elliptic to broadly obovate, circular in cross-section to much flattened, papillose to puncticulate, glabrous abruptly short-beaked or beakless, the orifice entire or bidentate. Achenes triangular, apiculate-tipped. Stigmas 3.

91. **C. spectábilis** Dew. Culms 2.5 to 5 dm. high, from densely matted tough rootstocks; leaf-blades 2 to 3.5 mm. wide; pistillate spikes 2 to 4, oblong, 1 to 2 cm. long, closely 15- to 30-flowered, not aggregated, the upper short-peduncled, the lower long-peduncled; scales purplish-black with white often excurrent midvein; perigynia flattened, ovoid, sessile, 4 mm. long, abruptly minutely beaked, the beak bidentulate; achene short-stipitate.—High Sierra Nevada, 6000 to 11,000 ft., from Tulare Co. to Siskiyou Co.; n. to Alas., e. to Mont.

92. **C. raynòldsii** Dew. Fig. 194. Culms 2 to 7.5 dm. high; leaf-blades 3 to 8 mm. wide; terminal spike 1 to 2 cm. long, the lateral pistillate spikes 2 or 3, approximate or lowest separate, peduncled, erect, oblong, 1 to 2 cm. long, closely 15 to 40-flowered; perigynia oblong-oval, round in cross-section, 3.5 to 4.5 mm. long, prominently ribbed and slenderly nerved, rounded at base, the very short beak minutely bidentate.—Mountain meadows and bogs, Sierra Nevada from Tulare Co. to Siskiyou Co., 7000 to 8000 ft.; n. to Can.

194. Carex raynoldsii Dewey; *a*, infl. x 1; *b*, scale x 7; *c*, perigy. x 7.

93. **C. bìfida** Boott. Fig. 195. Culms sharply triangular, slender, smooth, 4 to 8

195. Carex bifida Boott; *a*, infl. x 1; *b*, scale x 7; *c*, perigy. x 7.

dm. high, the basal sheaths purplish-tinged; leaf-blades 1.75 to 3.5 mm. wide; terminal spike 1.5 to 3 cm. long, staminate or with some perigynia; pistillate spikes 3 to 5, erect, short-peduncled or sessile, oblong, 8 to 18 mm. long, with 20 to 40 at length spreading perigynia; scales ovate, sharp-pointed; perigynia narrowly ovate, flattened triangular, about 10-nerved, 3 to 4.5 mm. long, the beak 0.5 to 1 mm. long, the teeth minute, rough and purplish-tinged within. — Tehachapi Range; Coast Ranges from San Luis Obispo Co. to Humboldt Co.; n. to southern Ore.

94. **C. buxbáumii** Wahl. Brown Sedge. Densely cespitose, but with long stolons; culms 2 to 9 dm. high, rough above, slender; leaf-blades 2 to 4 mm. wide, glaucous-green; spikes usually 3 or 4, erect, 8 to 40 mm. long, sessile or short-peduncled; scales awned, dark purplish-tinged, exceeding perigynia; perigynia 3 to 4 mm. long, glaucous-green, obovoid, lightly many-nerved, the apex minutely bidentate. —Bogs in the high Sierra Nevada of Tuolumne Co.; n. to Alas., e. to the Atlantic; Eurasia.

196. Carex helleri Mkze.; *a*, infl. x 1; *b*, scale x 7; *c*, perigy. x 7.

95. **C. hélleri** Mkze. Sierra Sedge. Fig. 196. Very densely cespitose, the culms 0.5 to 3 dm. high; leaf-blades 2 to 3.5 mm. wide; spikes oblong, 10 to 20 mm. long, densely 25- to 50-flowered; scales acuminate or aristate, much narrower than perigynia; perigynia broadly oval to suborbicular, much flattened, 2.5 to 3.5 mm. long, nerveless, abruptly beaked, the beak 0.25 mm. long, bidentate; achenes short-stipitate.— High montane, 8500 to 13,600 ft.: Sierra Nevada from Tulare Co. to Eldorado Co.; White Mts.; e. to Nev.

96. **C. èpapillòsa** Mkze. Culms 1.5 to 6 dm. high, stiff, sharply triangular, smooth; leaf-blades 3 to 8 mm. wide; spikes 3 to 6, approximate or a little separate, sessile or short-peduncled, oblong-ovoid, 1 to 2.5 cm. long, closely flowered; scales lance-ovate, sharp-pointed, narrower than but about equaling or exceeding perigynia; perigynia broadly oval or obovate, obscurely nerved. — Mountain meadows, high Sierra Nevada of Tuolumne Co.; e. to Wyo.

97. **C. héteronéura** W. Boott. Fig. 197. Culms 2.5 to 10 dm. high, slender, smooth or nearly so; leaf-blades 2 to 4 mm. wide; spikes 3 to 6, approximate or lower more or less strongly separate, sessile (the upper) to strongly peduncled (the lower), oblong, 0.7 to 2.5 cm. long, closely flowered with 15 to 40 appressed-ascending perigynia; scales acute, narrower than perigynia; perigynia sub-orbicular, strongly flattened, rounded at base and apex, the beak 0.25 mm. long, minutely bidentate.—High mon-

197. Carex heteroneura W. Boott; *a*, habit x 1; *b*, scale x 7½; *c*, perigy. x 7½.

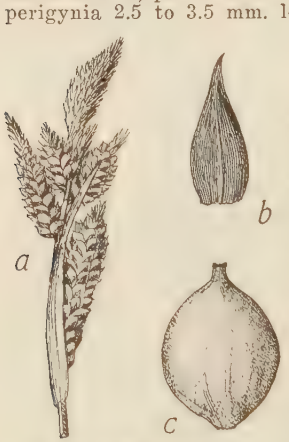
tane, 7000 to 11,000 ft.: coastal S. Cal.; White Mts.; Sierra Nevada from Tulare Co. to Nevada Co.; e. to w. Nev.

98. **C. albo-nigra** Mkze. Culms 1 to 3 dm. high; leaf-blades 2.5 to 5 mm. wide; spikes usually 3, closely approximate, sessile or very nearly so, linear-oblong, about 1 cm. long, closely flowered with 15 to 20 appressed-ascending perigynia; scales ovate, acutish, purplish-black usually with strongly developed white margins; perigynia obovate, strongly flattened, 3 to 3.5 mm. long, substipitate, abruptly beaked, the beak 0.25 mm. long, minutely bidentate; achenes narrower than perigynia, short-stipitate.—Dry mountain sides, high Sierra Nevada in Tulare Co.; e. to Ariz. and Col.

99. **C. merténsii** Prescott. Culms 3 to 10 dm. high, very sharply triangular, rough; leaf-blades 4 to 7 mm. wide; spikes 1 to 4 cm. long, the upper approximate, the lower more remote on slender peduncles; scales lance-ovate, acute; perigynia appressed, broadly oval, much flattened, purple-spotted, tapering at apex, minutely beaked, the beak 0.5 mm. long, entire; achenes strongly stipitate.—Mountains, Trinity Co.; a well marked and handsome species, abundant farther n.; extending to Alas. and Mont.

SECT. 28. ACUTAE Fries. Culms leafy below, aphyllopodic or phyllopodic. Terminal 1 to several spikes staminate (rarely gynaecandrous), linear, the others pistillate, linear to cylindric or oblong, closely many-flowered, sessile or peduncled. Bracts sheathless or rarely short-sheathing, leafy or squamiform, often bi-auriculate and darkened at base. Perigynia membranaceous to coriaceous, plano- or bi-convex or turgid, elliptic to obovate, puncticulate, margined, beakless or abruptly minutely beaked, the orifice entire to deeply bidentate. Achenes normally lenticular. Stigmas normally 2.

100. **C. scopulòrum** Holm. Culms 1 to 4 dm. high, stiff, sharply triangular, smooth; leaf-blades 3 to 7 mm. wide with revolute margins; terminal spike staminate or androgynous; lateral spikes 2 or 3, approximate, erect, sessile or short-stalked, pistillate or androgynous, 1 to 2.5 cm. long, 6 to 7 mm. wide; perigynia 2.5 to 3.5 mm. long, soon turgid, papillose, spreading, nerveless, with short but prominent entire beak.—Sierra Nevada at Whitney Mdws.; n. to Wash., e. to Col.



198. Carex gymnoclada Holm; *a*, infl. x 1; *b*, scale x 7; *c*, perigy. x 7.

101. **C. gymnóclada** Holm. Fig. 198. Culms sharply triangular, usually roughened above, developing some short blades the first year and in the flowering (second) year 2 to 4 erect blades, 2.5 to 4 mm. wide, flat with revolute margins; staminate spike short-peduncled, 5 to 15 mm. long; pistillate spikes 2 or 3, approximate, oblong or linear-oblong, 5 to 25 mm. long; perigynia appressed, obovoid, plano-convex, not turgid, 3 mm. long, often dark tinged, nerveless, granular, the beak straight, 0.25 mm. long.—High montane, 6000 to 9000 ft., Sierra Nevada from Tulare Co. to Siskiyou Co., thence w. to Trinity Co.; n. to Wash., e. to Col.

102. **C. nèbraskénsis** Dew. Fig. 199. Culms 2.5 to 10 dm. high, stout, rigid; leaf-blades pale green, 3 to 8 mm. wide, flat, the sheaths nodulose; staminate spikes 1 or 2, peduncled, 1.5 to 3.5 cm. long; pistillate spikes 2 to 5, oblong, sessile or short-peduncled, 1.5 to 6 cm. long, contiguous or the lower separate, with very many ascending perigynia; scales lanceolate, blackish; perigynia ascending, 3 to 3.5 mm. long, greenish straw color, compressed bi-convex, ribbed.—Meadows and swamps, 4000 to 9700 ft.: mts. of coastal S. Cal.; Sierra Nevada from Tulare Co. to Siskiyou Co.; Panamint Mts.; n. to B. C., e. to Kan.

103. **C. paúcicostàta** Mkze. Culms slender, 2.5 to 4 dm. high; leaf-blades light green, 2 to 4 mm. wide, flat or channeled at base; staminate spike solitary; pistillate spikes 4 to 6, linear, 1 to 4 cm. long, the numerous perigynia appressed-ascending; scales oblong, obtuse or acutish, blackish with lighter center; perigynia 2 mm. long, glaucous-green, the upper empty part

inconspicuous, abruptly black apiculate tipped.—Wet places, mostly around lakes, Sierra Nevada from Tulare Co. to Nevada Co., 5000 to 9900 ft.

104. **C. hindsii** C. B. Clarke. Culms slender, 1 to 6 dm. high; blades 1.5 to 3 mm. wide, flat or channeled at base; staminate spike solitary, long-peduncled; pistillate spikes 4 to 6, linear or oblong-linear, 1.5 to 4.5 cm. long, the numerous perigynia appressed-ascending; scales oblong, obtuse or acutish, blackish with lighter center, much shorter than perigynia; perigynia 2.5 to 3.5 mm. long, the upper part empty, abruptly black apiculate tipped.—Wet places along the coast, Del Norte Co.; n. to the Aleutian Isls.

105. **C. kellóggii** W. Boott. Culms slender, 3 to 7 dm. high; leaf-blades light green, flat or channeled at base, 1.5 to 3 mm. wide; staminate spike usually solitary; pistillate spikes 3 to 5, sessile or nearly so, approximate, linear, 1.5 to 4 cm. long, often attenuate at base, the numerous perigynia appressed-ascending; scales obtuse or acutish with broad light-colored center; perigynia 2.5 mm. long, the beak abruptly black apiculate tipped.—Wet places, 4000 to 9400 ft., Sierra Nevada from Tulare Co. to Siskiyou Co.; n. to Alas., e. to Col.

106. **C. sitchénsis** Prescott. BLACK-HEADS. Culms 6 to 12 dm. high, stout, sharply triangular, strongly reddened at base; leaf-blades flat or channeled at base, 2 to 9 mm. wide; staminate spikes 2 to 5, slender; pistillate spikes 3 to 5, strongly separate, linear-cylindric, 3 to 9 cm. long, very many-flowered; scales lanceolate, sharp-pointed; perigynia ovate or oval, 3 to 3.5 mm. long, broadest near middle, not red-dotted, apiculate.—Near the coast from Santa Cruz Co. to Del Norte Co., thence e. to Butte Co.; n. to Alas. Very local with us.

107. **C. aquátilis** Wahl. WATER SEDGE. Culms 2 to 7 dm. high, reddened at base; leaf-blades 2 to 6 mm. wide; staminate spikes 1 or 2, slender; pistillate spikes 2 to 4, sessile or short-peduncled, not aggregated, linear, 1.5 to 6 cm. long; scales oblong-obovate to lanceolate, obtuse or acutish; perigynia elliptic-obovoid, 2.5 mm. long, broadest below apex, red-dotted, minutely beaked.—Swampy grounds, Warner Mts., Modoc Co.; n. to Alas., e. to Que.

199. Carex nebraskensis Dewey; *a*, infl. x 1; *b*, scale x 7; *c*, perigy. x 7.

108. **C. bárbarae** Dew. Fig. 200. Culms 3 to 10 dm. high, stout, sharply triangular, serrulate at least in inflorescence; leaves 7 to 12, the sheaths brownish-puberulent, the blades light-green, thick, flat or channeled, 3.5 to 9 mm. wide, serrulate, the middle ones much reduced, filamentose; staminate spikes 1 or 2, narrowly linear; pistillate spikes 2 to 5, sessile or short-peduncled, oblong- or linear-cylindric, 2.5 to 8 cm. long, reddish-purple with lighter center; perigynia ascending, oval, obscurely nerved, 3 to 4.5 mm. long, at length brownish, often granular.—Mts. of coastal S. Cal., Sierra Nevada foothills, Great Valley, and Coast Ranges. One of the most characteristic Cal. species from about 20 to 4000 ft.; n. to Ore.

109. **C. schóttii** Dew. Culms 10 to 15 dm. high, sharply triangular, very rough above; leaf-blades flat with revolute margins, serrulate, the lower sheaths hispidulous dorsally; staminate spikes about 3, elongate-linear, 8 to 14 cm. long; pistillate spikes mostly 3, sessile or nearly so, elongate-linear, 11 to 14 cm. long; scales narrowly lanceolate, acute or obtusish, purplish-black with broad 3-ribbed lighter center; perigynia appressed, plano-convex,

200. Carex barbarae Dewey; *a*, infl. x ⅔; *b*, scale x 5; *c*, perigy. x 5.

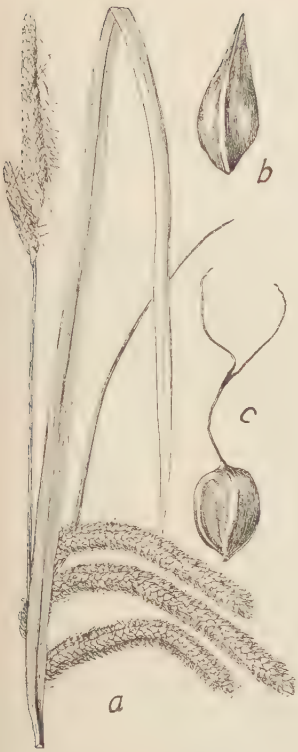
obovate, 3 mm. long, greenish straw-colored, strongly several-nerved on both faces, the beak 0.25 mm. long.—Coastal S. Cal. and n. to Monterey Co., 20 to 2500 ft.

110. **C. sénta** Boott. Culms 4 to 9 dm. high, sharply triangular; leaves 6 to 12, the middle sheaths sparingly hispidulous dorsally and filamentose ventrally, the blades 3 to 5 mm. wide, the middle ones much reduced; terminal spike staminate, peduncled, 3 to 4.5 cm. long, with 1 or 2 smaller ones at base; pistillate spikes 1 to 3, sessile or short-peduncled, 2.5 to 5 cm. long; scales oblong-ovate or lanceolate, obtuse to acuminate, purplish-black with lighter center; perigynia ovate, conspicuously several-nerved on both faces, green or straw-colored, often dark-tinged and frequently strongly red-dotted, granular, the beak 0.25 mm. long.—Coastal counties from Alameda Co. to San Diego Co.; Sierra Nevada from Amador Co. to Tulare Co.; e. to Ariz.

111. **C. nudàta** W. Boott. Culms slender, 3 to 8 dm. high, sharply triangular, strongly dark purplish at base; leaf-blades light green, flat with revolute margins, 2.5 to 3.5 mm. wide, smooth except toward apex, the basal sheaths rounded and hispidulous dorsally; staminate spike short-peduncled, 1.5 to 3 cm. long; lateral spikes 3 to 5, sessile or short-peduncled, 1 to 4 cm. long, 6 to 7 mm. wide; bracts conspicuously biauriculate; scales ovate, or oblong-ovate, obtuse or acutish, blackish with lighter midvein; perigynia lanceolate or ovate, compressed biconvex, 3 to 4 mm. long, finely 6 to 9-nerved on both faces, membranaceous, greenish straw-color or purplish-black tinged, smooth or slightly granular at apex, the upper portion empty, the beak 0.25 mm. long, entire.—Rocky beds of streams, 10 to 2000 ft.: Coast Ranges from Santa Clara Co. to Siskiyou Co.; Sierra Nevada from Calaveras Co. to Shasta Co.; n. to w. Ore.

112. **C. eurycárpa** Holm. Culms 4 to 9 dm. high, sharply triangular, roughened above; leaf-blades 3 to 4.5 mm. wide, the lower sheaths minutely hispidulous and rounded dorsally; staminate spike peduncled, 3 to 4 cm. long; lateral spikes 3 to 5, 2 to 4 cm. long; scales lanceolate, short-acuminate, purplish-brown with prominent light midvein; perigynia appressed, 2.75 mm. long, several-nerved on both faces, minutely roughened, greenish or straw-color, the beak 0.5 mm. long, emarginate.—Boggy meadows, Sierra Nevada from Mariposa Co. to Siskiyou Co.; n. to Wash.

113. **C. oxycárpa** Holm. Culms 4.5 to 9 dm. high, sharply triangular, slightly roughened above; leaf-blades 2 to 4 mm. wide, the lower sheaths hispidulous dorsally; terminal spike staminate, peduncled; lateral spikes 4 or 5, the upper 1 or 2 staminate, the lower 2 to 4 pistillate or androgynous, sessile or short-peduncled, 2.5 to 4.5 cm. long, 5 mm. wide; scales lanceolate, acute, purplish-black with light midvein; perigynia 3.5 mm. long, 3 to 5-striate on both faces, granular roughened, brownish, abruptly minutely apiculate, the orifice entire.—Wet meadows, n. Sierra Nevada from Butte Co. to Siskiyou Co.; n. to Wash. and Ida.



201. Carex obnupta Bailey; *a*, infl. x ½; *b*, scale x 4; *c*, perigy. x 4.

Sect. 29. Cryptocarpae Tuckerm. Stoloniferous. Culms aphyllopodic or phyllopodic. Terminal 1 to 3 spikes staminate, linear, the others pistillate, linear or oblong, closely many-flowered, the lower or all peduncled and erect or very often pendulous. Bracts sheathless, the upper at least biauriculate at base. Scales 3-nerved, usually cuspidate or aristate, but in some species obtuse. Perigynia coriaceous or membranaceous, plano- or biconvex or turgid, elliptic to obovate, puncticulate, margined, abruptly minutely beaked or beakless, the orifice entire or nearly so. Achenes lenticular, apiculate, constricted in the middle. Stigmas 2.

114. **C. lyngbyei** Hornem. Culms 3 to 9 dm. high; leaf-blades flat, 2 to 12 mm. wide; uppermost spike staminate, long-peduncled; lateral spikes 2 to 6, the upper 1 or 2 often staminate or androgynous, the lower pistillate, drooping, linear or oblong, 2 to 8 cm. long; perigynia oblong-oval, biconvex 2.5 to 3 mm. long, very minutely beaked. — Humboldt Co. coast; n. to the Aleutian Isls.; widely distributed in Arctic regions.

115. **C. obnúpta** Bailey. Fig. 201. Culms 5 to 15 dm. high; leaf-blades 5 to 8 mm. wide, thick; staminate spikes 2 or 3; pistillate spikes 2 to 4, oblong to linear-cylindric, 3 to 10 cm. long, strongly peduncled; scales narrowly ovate, blackish, sharp-pointed, concealing perigynia; perigynia coriaceous, 3 to 3.5 mm. long, abruptly minutely beaked, the beak entire.—Coastal counties from Monterey Co. to Del Norte Co. and local in the Sacramento Valley; n. to B. C.

Sect. 30 Trachychlaenae Drejer. Phyllopodic. Culms very stout, leafy below, the lower sheaths strongly filamentose ventrally. Spikes numerous, the upper 3 to 6 staminate, elongated, the lower 3 to 6 pistillate (or staminate at apex), linear-cylindric, densely very many-flowered, the lower at least long-peduncled. Lowest bract about equaling or exceeding the inflorescence, short-sheathing. Pistillate scales mucronate or aristate. Perigynia obovoid or oblong, glabrous, roughened or hispidulous, membranaceous, slightly inflated, apiculate-beaked, the orifice emarginate. Achene triangular, the sides flat or slightly concave. Stigmas 3.

116. **C. spíssa** Bailey. Fig. 202. Rootstocks stout, woody; culms 1 to 2 m. high, obtusely triangular, smooth; leaf-blades

202. Carex spissa Bailey; *a*, infl. x ⅔; *b*, scale x 6; *c*, perigy. x 6.

203. Carex yosemitana Bailey; *a*, infl. x 1; *b*, scale x 7; *c*, perigy. x 7.

glaucous-green, 7 to 14 mm. wide, flat with revolute strongly serrulate margins, the sheaths brownish tinged; pistillate spikes separate, erect, sessile or nearly so, 6 to 14 cm. long, the perigynia squarrose at maturity; scales narrowly ovate, serrulate-awned, light brownish; perigynia 3 to 4.5 mm. long, becoming somewhat inflated, very abruptly beaked, the beak 0.5 mm. long, the style very strongly bent and twisted; achenes elliptic-obovoid.—Banks of streams at low altitudes from Los Angeles Co. to San Diego Co.; s. to L. Cal.

SECT. 31. HIRTAE Tuckerm. Culms stout, leafy. Rootstocks with long stolons. Leaves septate-nodulose. Spikes 3 to 10, the upper 1 to 5 staminate, slender, the others pistillate, many-flowered, erect. Bracts leaf-like, equaling or exceeding the culm, often sheathing. Pistillate scales ovate or lanceolate, acute or aristate. Perigynia mostly ascending, coriaceous, ovoid or oblong-ovoid, somewhat inflated, nearly orbicular in cross-section, many-nerved, often hairy, round-tapering at base, tapering into the bidentate beak. Achenes triangular, often stipitate, the sides flat or deeply concave, apiculate. Stigmas 3.

117. **C. yosémitàna** Bailey. Fig. 203. Cespitose from stout rootstocks; culms 3 to 9 dm. high; leaf-blades not rigid, 3 to 7 mm. wide; terminal spike linear, 12 to 30 mm. long, more or less peduncled, occasionally with a few perigynia; pistillate spikes 3 or 4, more or less separate, sessile or nearly so, oblong-cylindric, 1 to 4 cm. long, closely flowered, often staminate at apex; scales lance-ovate, sharp-pointed, ciliate, chestnut-brown; perigynia 2.5 to 3.5 mm. long, obovoid, or oblong-obovoid, obscurely nerved, abruptly short-beaked, the beak 0.5 mm. long.—Montane, 4000 to 8000 ft.: Sierra Nevada from Tuolumne Co. to Tulare Co.; San Jacinto Mts.

118. **C. óregonénsis** Olney. OREGON SEDGE. Fig. 204. Rootstocks slender, woody, creeping; culms 1 to 5 dm. high, rigid, smooth; leaf-blades thick, rigid, 3 to 5 mm. wide, canaliculate, mostly exceeding culms; terminal 2 or 3 spikes staminate, linear, 8 to 25 mm. long; pistillate spikes 3 or 4, 1.5 to 5 cm. long, the lower more or less separate, closely erect, closely flowered above or loosely below, the perigynia appressed-ascending; scales ovate, acute to cuspidate, chestnut-brown tinged; perigynia ovoid, obtusely triangular, 4 to 5 mm. long.—Mountain meadows, Medicine Lake, Siskiyou Co.; n. to Wash.

204. Carex oregonensis Olney; *a*, infl. x 1; *b*, scale x 8; *c*, perigy. x 8.

205. Carex lanuginosa Michx.; *a*, infl. x ½; *b*, scale x 5; *c*, perigy. x 5.

119. **C. lanùginòsa** Michx. WOOLLY SEDGE. Fig. 205. Culms 3 to 10 dm. high, sharp-angled and rough above; leaf-blades flat, 1.5 to 5 mm. wide, rough; staminate spikes 1 to 3, up to 3 cm. long, distant; pistillate spikes 1 to 3, oblong-cylindric, 1 to 5 cm. long, sessile or short-peduncled, closely flowered; scales lanceolate, acuminate or aristate, reddish-brown tinged; perigynia broadly ovoid, 2.5 to 3.5 mm. long, the nerves obscure.—Wet meadows or swamps in the valleys and mountains, 500 to 8000 ft.: coastal S. Cal.; w. Mohave Desert; upper San Joaquin Valley; Sierra Nevada from Tulare Co. to Siskiyou Co.; n. to B. C., e. to N. S.

120. **C. sheldònii** Mkze. Culms very smooth below the spikes, 5 to 10 dm. high, not fibrillose at the base; leaf-blades 3.5 to 6 mm. wide, the sheaths dark-tinged at the mouth, the basal breaking and slightly filamentose; staminate spikes 2 or 3, distant; pistillate spikes usually 2, 2 to 5 cm. long, rather closely flowered; scales ovate-lanceolate, acuminate or cuspidate; perigynia 5 to 6 mm. long.—Swamps, Warner Mts., ne. Cal.; n. to Ore., e. to Ida.

SECT. 32. EXTENSAE Fries. Culms slender but strict, obtusely triangular, leafy toward base. Leaves sparingly septate-nodulose, the blades narrow. Spikes 2 to 10, the terminal usually staminate, the others pistillate, suborbicular to oblong, densely flowered, 3 cm. or less long, the upper sessile and approximate, the lower remote, peduncled, erect. Bracts leafy, more or less sheathing. Pistillate scales ovate, mostly reddish, copper or chestnut tinged. Perigynia ascending, spreading or deflexed, membranaceous, smooth, many-nerved, somewhat inflated, obscurely triangular, rounded at base, contracted into a bidentate beak, the teeth very erect. Achenes triangular with flat sides. Stigmas 3.

121. **C. virídula** Michx. GREEN SEDGE. Densely cespitose, the culms 0.6 to 3 dm. high, smooth; leaf-blades 1 to 3 mm. wide, canaliculate; staminate spike sessile or short-peduncled; pistillate spikes 2 to 6, 4 to 12 mm. long; scales ovate, much shorter than perigynia, obtuse or acutish; perigynia 2 to 3 mm. long, the beak scarcely ½ length of body.—Swamps on the Mendocino coast; n. to Alas., e. to the Atlantic.

SECT 33. PHYSOCARPAE Drejer. Culms mostly tall and stout. Leaves septate-nodulose, not hairy. Spikes 2 to 10, the upper 1 to 5 staminate, the others normally pistillate, subglobose to linear-cylindric, generally closely many-flowered, erect, short-peduncled, more or less remote. Bracts leaf-like, much exceeding the inflorescence, normally sheathless. Perigynia ascending, spreading or even reflexed, membranaceous, smooth, from little to much inflated, suborbicular in cross-section, coarsely many-ribbed or nerveless, contracted into a beak, the beak entire to bidentate. Achenes much shorter than perigynia, triangular or lenticular. Stigmas 3 or 2.

122. **C. vesicària** L. Fig. 206. Rootstocks short-creeping and stoloniferous; culms 3 to 10 dm. high, aphyllopodic, purplish-tinged at base; leaf-blades 2 to 7 mm. wide, the sheaths sparingly nodulose dorsally; staminate spikes 2 to 4, linear, 2 to 4 cm. long; pistillate spikes 1 to 3, sessile or short-peduncled, oblong-cylindric, 2.5 to 7.5 cm. long, more or less strongly separate; scales ovate-lanceolate, sharp-pointed; perigynia ovoid, yellowish-green or darker tinged.—Wet meadows and swamps: Coast Ranges from Marin Co. to Siskiyou Co., 20 to 2000 ft.; Sierra Nevada from Tulare Co. to Siskiyou Co.; n. to B. C., e. to the Atlantic. Very variable.

206. Carex vesicaria L.; *a*, infl. x ½; *b*, scale x 3; *c*, perigy. x 3.

123. **C. exsiccàta** Bailey. TALL SWAMP SEDGE. Fig. 207. Rootstocks short-creeping; culms 3 to 10 dm. high, rough above, aphyllopodic, purplish-tinged at base; leaf-blades 3 to 7 mm. wide, the sheaths sparingly nodulose

207. Carex exsiccata Bailey; *a*, infl. x ⅔; *b*, scale x 4; *c*, perigy. x 4.

dorsally; staminate spikes 2 to 4, 2 to 4.5 cm. long, narrow; pistillate spikes 1 to 3, sessile or short-peduncled, more or less strongly separate, cylindric, 2 to 7.5 cm. long; scales lanceolate-ovate, sharp-pointed; perigynia lanceolate, olive green.—Wet places along the coast from Santa Cruz Co. to Humboldt Co.; n. to Alas., e. to Mont.

124. **C. rostràta** Stokes. BOTTLE SEDGE. Fig. 208. Cespitose, sending forth long horizontal stolons; culms phyllopodic, 3 to 12 dm. high; leaf-blades 2 to 12 mm. wide; staminate spikes 2 to 4, slender, 1 to 6 cm. long; pistillate spikes 2 to 5, remote, cylindric, sessile or short-peduncled, 1 to 15 cm. long; scales lanceolate, sharp-pointed; perigynia ovoid, 4 to 6 mm. long, greenish straw color or darker tinged.—Swampy places: abundant in the Sierra Nevada from Butte Co. to Tulare Co., 4000 to 6200 ft.; San Bernardino Mts.; San Francisco Bay region; n. to Alas., e. to the Atlantic.

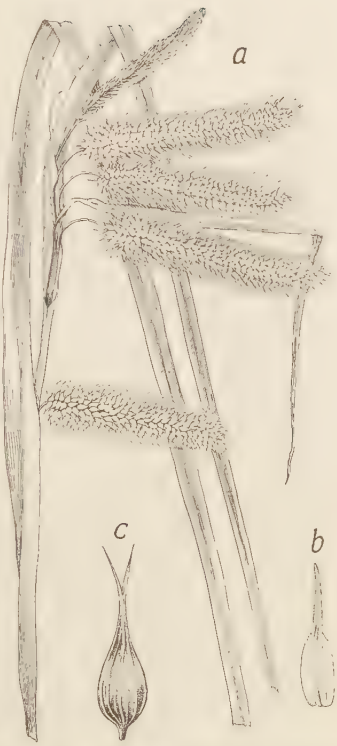
SECT. 34. PSEUDO-CYPEREAE. Tuckerm. Culms tall, generally stout, acutely angled, leafy below. Leaf-blades flat, septate-nodulose. Spikes 3 to 9, the upper 1 to 3 slender, staminate, the others normally pistillate, densely flowered, the upper approximate, the lower remote and strongly peduncled, often nodding. Bracts leaf-like, much exceeding the culms, mostly not sheathing. Pistillate scales aristate. Perigynia spreading or reflexed, membranaceous or stiff, triangular or circular in cross-section, 3 to 8 mm. long, closely many-ribbed, greenish straw-color, smooth, stipitate, contracted into a rigid beak, the teeth slender. Achenes triangular. Stigmas 3, short.

125. **C. hystricina** Muhl. PORCUPINE SEDGE. Cespitose and stoloniferous; culms 1.5 to 10 dm. high, rough above; leaf-blades 2 to 10 mm. wide; staminate spike 1 to 5 cm. long, slender-peduncled; pistillate spikes 1 to 4, approximate or strongly separate, densely many-flowered, oblong or oblong-cylindric, 1 to 6 cm. long, the lower slender-peduncled; scales green, 3-nerved, rough-awned, narrower and mostly shorter than perigynia; perigynia 5 to 7 mm. long, ascending or at length spreading. — Swampy soil, Trinity Co.; n. to Alb., e. to the Atlantic.

126. **C. comòsa** Boott. BRISTLE SEDGE. Fig. 209. Cespitose and not stoloniferous; culms 5 to 15 dm. high, strongly roughened to smooth; leaf-blades 6 to 16 mm. wide; staminate spike 3 to 7 cm. long, slender-peduncled; pistillate spikes 1 to 4, densely many-flowered, oblong-cylindric,

208. Carex rostrata Stokes; *a*, infl. x ⅔; *b*, scale x 5; *c*, perigy. x 5.

1 to 7.5 cm. long, the upper erect and short-peduncled, the lower slender-peduncled and at length nodding; scales narrow, mostly shorter than perigynia, very rough-awned; perigynia lanceolate, rigid, 5 to 7 mm. long, reflexed when mature.—Swamps near the coast: San Bernardino Valley; Santa Cruz Mts. to Lake Co.; n. to Wash., e. to the Atlantic.



209. Carex comosa Boott; *a*, habit x ½; *b*, scale x 3; *c*, perigy. x 3.

PALMÀCEAE. Palm Family

Commonly trees with fibrous roots and columnar unbranched trunks bearing a tuft of large leaves at summit. Leaves sharply plaited when young, eventually tearing more or less along the lines of the folds. Flowers minute, commonly monoecious, in ours perfect, borne in a large inflorescence inclosed by a spathe. Perianth in two circles, an outer 3-lobed calyx and an inner 3-parted corolla. Stamens 6, inserted on the corolla-tube. Carpels 3, separate or united, each 1-ovuled. Fruit a berry, drupe or nut.

1. **WASHINGTÒNIA** Wendl. Fan Palm

Trees with fan-shaped much folded blades and long petioles armed with stout hooked spines along the margins. Pistil 1; ovary 3-celled; style and stigma 1. Fruit a berry. (In honor of President Washington.)

1. **W. filífera** Wendl. California Fan Palm. Columnar tree 20 to 75 ft. high, the trunk 1 to 3 ft. in diameter; leaves 3 to 6 ft. long, with 40 to 60 folds, torn nearly to the middle, the divisions copiously fibrous; flowers borne in a branched panicle on long stems, the whole 8 to 12 ft. long; berries black, oval, 3 to 3½ lines long, with thin flesh surrounding a large seed; endosperm horny.—W. and n. sides of the Colorado Desert, on or above the old beach line of the one-time interior sea, always in moist spots or oases, from near sea-level to 3500 ft.

ARÀCEAE. Arum Family

Perennial glabrous herbs with large leaves, perfect or usually unisexual flowers crowded on a spadix surrounded by a usually colored spathe. Ovary 1 to several-celled, ovules 1 to several in each cell. Fruit in ours a berry.

Spathe yellow; perianth present; ovary inferior.....1. Lysichiton.
Spathe white; perianth none; ovary superior.....2. Calla.

1. **LYSÍCHITON** Schott

Peduncle and basal leaves from a stout rootstock. Flowers perfect; perianth-segments 4, distinct, with 4 opposite stamens. Ovary 2-celled, 1 ovule in each cell; stigma depressed. Berry 2-seeded, sunk in the spadix. (Greek lusis, a loosing, and chiton, a tunic or covering, referring to the spathe.)

1. **L. kamtschatcénse** (L.) Schott. Skunk Cabbage. Coarse herb; leaves yellow, oblong to elliptic, 1 to 4 ft. long and ½ to 1¼ ft. wide; peduncle stout, shorter than the leaves; flowering spadix 1 to 3 in. long.—Swamps along the coast: Santa Cruz Mts. to Humboldt Co.; n. to Alas. and Siberia.

2. **CÁLLA** L.

Perennial herb with rootstocks, long-petioled cordate leaves and solitary scapes. Flowers perfect or the upper staminate. Stamens 6. Ovary 1-celled: ovules 5 to 9. Berries red. (Ancient name.)

1. **C. palústris** L. Water Arum. Plants about 1 ft. high.—Bogs, Glen Blair, Mendocino Co. (Zoe 5:58); B. C.; ne. N. Am.

LEMNÀCEAE. Duckweed Family

Minute floating or submerged aquatic perennials, without leaves. Plant body consisting of a leaf-like stem or "frond" which is densely green, disk-shaped, elongated or irregular. Basal margin of the frond with 1 or 2 clefts or reproductive pouches. Vegetative reproduction active, the daughter fronds arising from the reproductive pouches and attached to the parent frond by slender stalks (or stipes). Inflorescence, when present, consisting of a simple cluster of 2 staminate flowers and 1 pistillate flower, contained in the reproductive pouch, subtended by a sac-like spathe, and imitating a single flower. Staminate flower consisting of a single stamen and the pistillate flower of a single ovary with 1 to 7 ovules. Perianth none. Flowers and fruit scarce, in one genus unknown. The daughter fronds soon separate or remain connected for some time; they may at certain seasons sink to the bottom of the pond or ditch and undergo a resting period.

Fronds with roots; vegetative pouches 2, posteriorly placed.
Frond 5 to 15-nerved, with several roots.....1. Spirodela.
Frond 1 to 5-nerved, with a single root.....2. Lemna.
Fronds without roots, thin, strap-shaped; vegetative pouch 1.....3. Wolffiella.

1. SPÌRODÈLA Schleiden

Fronds with many fascicled roots. Roots with one vascular bundle. Reproductive pouches 2, with cleft-like openings in either margin of the basal portion of the frond. Inflorescence consisting of a cluster of 1 pistillate and 2 staminate flowers borne in the reproductive pouches and subtended by a sac-like spathe. Fruit round-lenticular, with winged margins. (Greek speira, a cord, and delos, evident.)

1. **S. polyrhìza** Schleiden. Fronds solitary or in colonies of 2 to 5, roundish obovate, 5 to 15-nerved, 1½ to 4 lines long, usually sterile.—S. Cal.; cosmopolitan.

2. LÉMNA L. Duckweed

Fronds disk-shaped, usually with a central nerve and with or without several lateral nerves, each with a single root which is commonly provided with a root cap. Reproductive pouches 2, appearing as clefts in either margin of the basal portion of the frond, each containing a cluster of 3 flowers surrounded by a spathe. Ovary with 1 to 7 ovules. Fruit ribbed. (Ancient Greek name.)

Frond with a long stipe, mostly submerged and forming large masses; papillae none.....
3. *L. trisulca.*
Frond with a short stipe, floating on the surface.
Symmetrical or nearly so, papillate along the median line.
Oblong-ovate; fruit more or less lenticular.
Upper surface uniformly green; margin of the fruit without appendages; seed always 1.....2. *L. minor.*
Upper surface mottled with irregular brown streaks; margin of the fruit with rounded wing lobes; seeds 1 to several.....1. *L. gibba.*
Oblong to elliptical, small, green on both surfaces, with a row of papillae along the mid-nerve; fruit elongated.....5. *L. minima*
Unsymmetrical.
Obliquely obovate, obscurely 3 to 7-nerved, papillate along the median line.....
1. *L. gibba*
Long oblong, thin, obscurely 1-nerved; papillae none.....4. *L. cyclostasa*

1. **L. gíbba** L. Gibbous Duckweed. Fronds 1 to 4 in a group, commonly 2, orbicular to obovate, slightly to very unsymmetrical, usually 3 to 5-nerved, 1 to 2 lines wide, 1 to 2½ lines long, thick, convex and slightly keeled above, flat to strongly gibbous beneath; base usually acute and commonly with narrow wing margins; pistil clavate; ovules 1 to 7; fruit symmetrical, purple-tinted, winged with rounded lobes at the upper margin on either side of the stigma.—Stagnant ponds; all continents except S. Am.

2. **L. minor** L. Smaller Duckweed. Fronds solitary or few in a cluster, round to elliptic-obovate, green or purplish beneath, uniformly bright-green

above, convex on both sides, upper surface sometimes slightly keeled and with a row of papillae along the mid-nerve, the apical one usually quite prominent; pistil clavate; ovule 1; fruit not winged, projecting about ⅓ beyond the margin of the frond.—Stagnant pools, abundant. All continents except S. Am.

3. **L. trisúlca** L. Ivy-leaf Duckweed. Fronds forming dense masses, oblong to oblong-lanceolate, slightly unsymmetrical and frequently a little falcate, 2½ to 5 lines long and 1½ lines wide, the long stipe attached to the basal margin; floating fronds with shorter stipes and cavernous throughout the central portion; submerged fronds with long twisted stipes; seed prominently 12 to 15-ribbed.—Cold springs and running water, Sierra Nevada. All continents except S. Am.

4. **L. cyclóstasa** Chev. Fronds solitary or more commonly 2 to 8 cohering in a more or less curved chain, thin, oblong to obovate-oblong, usually somewhat falcate, ⅓ to ¾ lines wide by 1 to 1¼ lines long, without papillae; base of the frond usually unsymmetrical, tapering into a short stipe or frequently sessile; fruit long-ovate, pointed by the long, straight or rarely curved style; seed 12 to 29-ribbed.—Springs and pools; N. and S. Am.

5. **L. mínima** Phil. Fronds cohering in 2s, sometimes in 4s, or solitary, oblong to elliptical, symmetrical, ½ to 1¼ lines wide, ¾ to 2 lines long, rather thick, with a row of papillae along the mid-nerve; lower surface flat or slightly convex, upper surface slightly to prominently convex with thin margin entirely around the frond; frond cavernous in the middle portion only, commonly nerveless; seed oblong, pointed, about 16-ribbed.—Two growth stages: smaller fronds straw-yellow or pale green and strikingly convex on the upper surface; larger fronds thinner and green-colored.—Pools, Cal., e. to Wyo. and Fla.

3. **WOLFFIÉLLA** Hglm.

Fronds minute, thin, band-like or ligulate, somewhat curved, rootless. Reproductive pouch one, triangular, opening as a cleft in the basal margin of the frond. Flowers and fruit unknown. Stipe of the daughter frond attached on the margin of the reproductive pouch. (Diminutive of Wolffia.)

Fronds saber-shaped.....1. *W. oblonga.*
Fronds ligulate.....2. *W. lingulata.*

1. **W. oblónga** Hglm. Fronds solitary or in pairs, rarely 3s, slightly falcate, tapering from the rounded base to the somewhat narrower rounded apex, sometimes oblong, rarely straight, 1½ to 2¼ lines long.—S. Cal., Mex., S. Am.

2. **W. lingulàta** Hglm. Fronds solitary or in pairs, ovate to oblong-ligulate, 1¼ to 3¼ lines long.—Kern Co.; San Bernardino Valley; Mex.

PONTEDÈRIÀCEAE. Pickerel Weed Family

Aquatic herbs. Perianth with a tube, its limb 6-lobed or 6-parted. Stamens 3 or 6, inserted on the throat of the perianth. Ovary superior, 1 or 3-celled.

1. **HÉTERANTHÈRA** R. & P.

Ours submerged grass-like herbs, only the flowers reaching the surface. Spathe 1-flowered. Perianth with elongated filiform tube and rotate 6-parted limb; segments linear-lanceolate. Stamens 3. Ovary 1-celled with 3 parietal placentae. (Greek heteros, different, and anthera, anther, the stamens unequal in some species.)

1. **H. dùbia** MacM. Leaves linear or ribbon-like, translucent; perianth small, pale yellow, its tube about 4 in. long.—Still water: Mendocino Co.; Ore. and e. to the Atlantic.

Eichórnia Kunth. Herbs with rootstock, floating or rooting in mud. Petioles wholly or partly inflated, the blades roundish to ovate. Perianth bluish purple. Stamens 6. Ovary 3-celled. E. crássipes Solms. Water Hyacinth. Scapes 4 to 16 in. high; blades 2½ to 3 in. broad.—Nat. of trop. Am.; locally established as a weed at a few stations (Fresno, San Bernardino).

JUNCÀCEAE. Rush Family

Annual or perennial herbs. Stems simple, terete or ancipital. Leaves alternate, sheathing, narrow, flat or terete. Flowers lily-like in structure, sedge-like in aspect, small, dry, perfect, disposed in terminal or sometimes apparently lateral heads, spikes, corymbs or panicles. Perianth with 6 distinct similar glume-like segments. Stamens 6 or sometimes 3. Ovary superior, 3 or sometimes 1-celled; stigmas 3, filiform; ovules 3 to many. Fruit a loculicidally 3-valved capsule. Embryo minute, inclosed in fleshy endosperm.—In both the genera Luzula and Juncus, individuals of the same species vary greatly in aspect owing to the tendency of the inflorescence to become either capitately-congested on the one hand or loosely paniculate on the other. The hue of the inflorescence is, however, very constant. The lowest bract of the inflorescence is here termed the involucral bract.

Leaves stiff, terete or flat; stems usually with spongy pith; capsule 3 or 1-celled; seeds several to many ..... 1. JUNCUS.
Leaves soft, flat; stems hollow; capsule 1-celled; seeds 1 to 3 ..... 2. LUZULA.

1. JÚNCUS L. Rush

Plants of swamps or wet places; herbage glabrous. Stems simple (rarely branching), with spongy pith or sometimes hollow, leafy, or naked and scape-like. Leaves stiff, terete, channeled or flat, the blades arising from sheaths or the sheaths sometimes bladeless. Flowers greenish or brownish. Stamens 6, or when 3 opposite the outer perianth segments. Capsule 3-celled with central placentae or 1-celled with 3 parietal placentae, many-seeded. (Classical name for the Rush, perhaps from Latin jungo, to join, the stems used for binding.) Sheaths sometimes bearing a ligule at summit.

A. Inflorescence apparently lateral; involucral bract erect, appearing like a continuous prolongation of the stem; leaves all basal, reduced to sheaths or the inner sheaths sometimes blade-bearing and terete; ligules none; stems scape-like; perennials.

Flowers 3 to 9 in head-like clusters, the clusters disposed in a panicle; inner sheaths blade-bearing; stems and blades stout and pungent.
Perianth segments brownish, scariously margined or winged, the inner obovate, emarginate, a line long; capsule subglobose, obtuse ..... 1. *J. acutus.*
Perianth segments greenish, not winged, the inner lanceolate, rarely ovate, acute, 3 lines long; capsule ovate, acute ..... 2. *J. cooperi.*
Flowers inserted singly on the racemose branches of the panicle, distinctly separated to somewhat crowded but never truly capitate; stems usually slender and rigid; sheaths bladeless except nos. 6 and 10.
Flowers many to numerous, in panicles or compound panicles.
Flowers large (2 lines long or more); perianth segments scarious-margined; capsule oblong-ovate.
Flowers dark brown; perianth segments with deep purple margins ..... 3. *J. lescurii.*
Flowers mostly greenish; perianth segments with whitish margins or only faintly purplish
Sheaths quite bladeless.
Perianth greenish or dark, the bractlets scarious; common, widely distributed ..... 4. *J. balticus.*
Perianth and bractlets concolorous; S. Cal. ..... 5. *J. textilis.*
Sheaths bearing scape-like blades ..... 6. *J. mexicanus.*
Flowers small (less than 1 line long); perianth segments not scarious-margined; capsule obovate or subglobose.
Stamens 6; capsule broadly subglobose, obtuse, apiculate ..... 7. *J. patens.*
Stamens 3; capsule narrow, clavate, obovate, obtuse or retuse .. 8. *J. effusus.*
Flowers few (1 to 3); low alpine plants.
Inner sheaths bristle-tipped; capsule retuse; plants ½ to 1½ ft. high ..... 9. *J. drummondii.*
Inner sheaths blade-bearing; capsule acute; plants ½ ft. high or less ..... 10. *J. parryi.*

B. Inflorescence terminal; involucral bract not a continuation of the stem (or if so conspicuously channeled along the upper side).

1. Low dwarf annuals with fibrous roots.

Stamens 6; flowers secund, remote; stems branching from the base; leaves cauline.
Plants 4 to 10 in. high; capsule oblong ..... 11. *J. bufonius.*
Plants 1½ to 2 in. high; capsule elliptic ..... 12. *J. sphaerocarpus.*
Stamens 3; flowers in small heads; stems short with several scape-like peduncles; leaves mostly basal; plants 1 to 3 in. high; capsule ovate, apiculate ... 13. *J. triformis.*

2. TALLER PERENNIALS; ROOTSTOCKS MOSTLY STOUT AND CREEPING.

a. Leaves not transversely ribbed, usually flat.

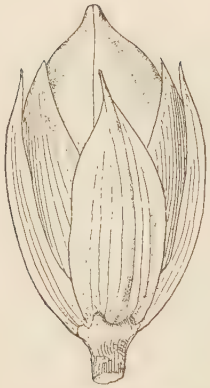
Stems naked; flowers solitary in a diffuse (rarely compact) panicle; leaves very fine, with ligules....14. *J. tenuis.*
Stems more or less leafy; flowers capitate or clustered; leaves flat or grass-like.
Stems low, mostly equaling the leaves; ligules none; styles usually short.
Involucral bract short; heads usually solitary; perianth equaling the capsule, its segments brown-margined....15. *J. falcatus.*
Involucral bract elongated; heads 3 to 6; perianth shorter than the capsule; its segments broadly white-margined....16. *J. obtusatus.*
Stems taller, exceeding the leaves; heads 2 to 6 or many; styles long exserted.
Ligules present; leaves narrow.
Anthers red-brown; leaves channeled....17. *J. canaliculatus.*
Anthers white; leaves flat....18. *J. longistylis.*
Ligules absent; leaves broad....19. *J. latifolius.*

b. Leaves transversely ribbed by internal septa.

Leaves narrow, terete or sub-terete, not equitant; ligules and septations usually conspicuous; stems usually slender.
Early leaves capillary and floating....20. *J. supiniformis.*
Leaves all erect, not capillary or floating.
Heads large (except no. 22).
Perianth dark colored.
Heads usually few or solitary; perianth segments moderately pliable.
Very slender commonly low grass-like plants; heads very dark brown; high montane.
Heads solitary, wholly very dark brown; capsule obovoid, obtuse; styles included; high montane....21. *J. mertensianus.*
Heads usually 2 or more, dark brown with whitish or scarious bractlets at base; capsule oblong, usually acutish; styles exserted....22. *J. nevadensis.*
Tall plants with less slender stems; heads densely many-flowered; perianth dark brown; capsule narrowly oblong, very dark; coast valleys....23. *J. bolanderi.*
Heads numerous in a dense or capitate cluster; perianth segments lanceolate, light brown, subspinescent or very rigid....24. *J. torreyi.*
Perianth segments pale and scarious, often obtuse....25. *J. chlorocephalus.*
Heads small, numerous, in large compound panicles; plants very tall and slender.
Stems smooth....26. *J. dubius.*
Stems markedly rugulose....27. *J. rugulosus.*
Leaves equitant, usually flattened; septations inconspicuous; ligules usually inconspicuous or absent; stems rather stout, flattened, 2-edged.
Heads small, numerous, in large compound panicles; perianth segments linear-lanceolate; capsule narrow, attenuate....28. *J. oxymeris*
Heads larger, usually few; perianth segments lanceolate; capsule oblong, acute.
Leaves 2 to 4 lines wide; perianth segments light red dish brown; capsule abruptly acuminate.
Stamens 6; valleys and lower altitudes....29. *J. xiphioides.*
Stamens 3; higher mountains or near the coast northward....30. *J. ensifolius.*
Leaves ½ to 1½ (or 2) lines wide; perianth segments very dark; capsule long acuminate....31. *J. phaeocephalus.*

210. Juncus acutus L. var. sphaerocarpus Engelm.; *a*, base of plant x ¼; *b*, infl. x ⅓; *c*, perianth and capsule x 5.

1. **J. acūtus** L. var. **sphaerocárpus** Engelm. Fig. 210. Stems terete or slightly compressed, 2 to 4 ft. high, stout, rigid and pungent; panicle compound with unequal branches, usually 3 to 6 in. long, erect and strict, usually exceeding the involucral bract; secondary bracts long acuminate, equaling or exceeding the flowers; clusters 2 to 4-flowered; perianth segments scarious-margined very broadly at apex, especially the inner, 1 line long, exceeding the stamens, the outer broadly lanceolate, acute, the inner obovate and deeply emarginate; capsule subglobose, narrower at base, rounded at summit, apiculate, brown, nearly 2 lines long; seeds acute at each end or slightly caudate, about ½ line long, very finely ribbed.—Along the coast from San Francisco to San Diego, thence e. into the Colorado Desert and s. to L. Cal.



211. J. cooperi Engelm.; perianth and capsule x 6.

2. **J. cóoperi** Engelm. DESERT RUSH. Fig. 211. Similar in habit to J. acutus but the flowers larger, the perianth segments lanceolate, sometimes oblong-lanceolate or ovate, the outer acute, the inner mucronate, 2½ to 3 lines long; capsule ovate, acute, slightly longer than the perianth, greenish; seeds larger, with broad white appendages at each end, or slightly margined on one side.—Salt marshes and alkaline flats, Colorado and Mohave deserts; e. to Nev.

3. **J. lescúrii** Boland. SALT RUSH. Fig. 212. Stems 1 to 3 ft. high, stout, erect, terete; rootstock stoutish; panicle lateral, lax or compact, many-flowered; flowers commonly somewhat secund; perianth segments with green midribs and membranous mostly purplish brown margins, 2 to 3 lines long, outer segments lanceolate-acuminate, the inner ones a little shorter and sometimes less pointed; capsule oblong or ovoid, mucronate, triangular, shorter than the perianth; seeds ovoid, obtuse, scarcely apiculate, smoothish or faintly reticulate, ⅓ to ½ line long.—Salt-marshes or near sand dunes or beaches, Monterey Co. to Humboldt Co.; n. to Alas.

4. **J. bálticus** Willd. WIRE RUSH. Fig. 213. Plants caespitose, grass-like, 1 to 3½ ft. high; stems strict, terete or sometimes compressed, mediumly stout, sulcately channeled; panicle lateral, lax, many-flowered, its branches disposed to be secund; perianth segments lanceolate, acuminate, greenish, 1½ to 2½ lines long, sometimes faintly lined with purple inside the white scarious margins; inner segments a little shorter and less pointed or obtuse; capsule equaling or shorter than the perianth, ovoid, acute; seeds shortly oblong-cylindric, obscurely apiculate and faintly striate longitudinally, ¼ to ⅓ line long.—Widely spread throughout Cal., 100 to 2500 ft. Am., Eur. Var. MONTÀNUS Engelm. Lower, the stems more slender, sometimes flattened; panicle very small. — Montane. Var. ERÈMICUS Jepson n. var. Capsule longer than the perianth.— Mo-

212. Juncus lescurii Boland.; *a*, infl. x 1; *b*, perianth and capsule x 5.

213. Juncus balticus Willd.; *a*, infl. x 1; *b*, perianth and capsule x 8.

214. Juncus textilis Buch.; *a*, infl. x 1; *b*, perianth and capsule x 7.

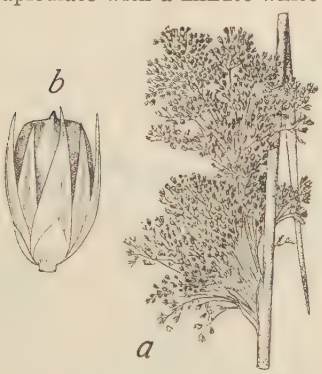
have Desert to Inyo Co. (Owens Lake, Jepson 5116, type).

5. **J. téxtilis** Buch. INDIAN RUSH. Fig. 214. Similar to J. balticus; stems much shorter, 3 to 6 ft. high, very finely channeled; panicle with longer branches; bractlets and perianth concolorous mostly; inner perianth segments obtuse.—S. Cal.

6. **J. mexicànus** Willd. Stems slender, grass-like, usually compressed, often contorted; basal sheaths usually bearing a scapiform blade; panicle small; outer perianth segments narrowly lanceolate; capsule ovate, long-beaked.—Death Valley region and s. through S. Cal. to Mex.

7. **J. pàtens** Mey. COMMON RUSH. Fig. 215. Stems slender, densely tufted, 1½ to 3 ft. high, erect, terete; rootstock creeping; sheaths rarely awn-tipped; panicle lateral, lax, many-flowered; perianth 1 line long, pale or brownish, its segments lanceolate or broadly subulate, spreading in fruit; stamens 6; anthers ¼ line long, about ½ as long as the filaments; capsule sub-globose, slightly angled, obtuse, apiculate, a little shorter than the perianth; seeds apiculate with a minute white appendage or none.—A common species, in marshy or springy ground, coastal region from Santa Barbara Co. to Del Norte Co.; n. to Wash.

215. Juncus patens Mey.; perianth and capsule x 12.



216. Juncus effusus L.; *a*, infl. x ⅔; *b*, perianth and capsule x 9.

8. **J. effùsus** L. BOG RUSH. Fig. 216. Similar in habit to J. patens but stamens and perianth segments smaller and not so spreading; stems terete, 2 to 4 ft. high; inner sheaths tipped with a short awn; panicle slender, usually diffuse, many-flowered; perianth pale brown, 1 line long, the segments lanceolate, acute, equaling the capsule; capsule obovoid or even broadly clavate, obtuse or retuse, triangular; stamens 3, anthers equaling the filaments; seeds apiculate.—Common in springy spots or bogs, forming very dense or heavy clumps on hillsides or valley flats; Coast Ranges,

Sierra Nevada and S. Cal.; also distributed widely throughout the north temperate regions of both the Old and the New World. Also called Sugar Grass. Var. EXÍGUUS Fer. & Weig. Very slender; sheaths pale; flowers very small, pale.—Yosemite Park; Mt. Shasta. Var. GRÁCILIS Hook. Culms rigid, wiry, perianth segments with lateral dark-brown bands.—Mt. Sanhedrin and n. to B. C. Var. BRÙNNEUS Engelm. Nigger Heads. Panicle usually very short and compact; perianth and capsule dark brown.—Coast form.

9. **J. drummóndii** E. Mey. Fig. 217. Densely caespitose; stems slender, terete, 6 to 15 in. high; inner sheaths bristle-tipped; spathe ½ to ¾ in. long, equaling or exceeding the inflorescence; perianth segments 3 lines long, with brown margins, lanceolate, acute, the inner a little shorter; capsule brown, oblong, retuse, nearly equaling the perianth; seeds ovate, caudate at both ends, brown.—High montane, 7000 to 9000 ft., Sierra Nevada from Tulare Co. to Siskiyou Co.; n. to Alas.; also in the Rocky Mts. The bladeless leaf-sheaths in this species form short but dense tufts on the root-crown. The capsule-valves are distinctly retuse, a character which is especially noticeable after dehiscence. In J. parryi the valves are acute.

217. Juncus drummondii E. Mey.; *a*, habit x ½; *b*, perianth and capsule x 5; *c*, seed x 15.

10. **J. párryi** Engelm. Fig. 218. Caespitose; stems filiform, 3 to 6 in. high; inner sheaths leaf-bearing, the leaves sulcate at base, terete above, much shorter than the stems; ligules none or obscure; spathe exceeding the inflorescence, ¾ to 1 in. long; perianth segments 3 lines long, more or less tinged with brown, lanceolate-acuminate, or the inner obtuse; capsule oblong or narrowly oblong, acute, about equaling or a little exceeding the perianth; seeds as in J. drummondii. — Thin soil drift or alpine meadowlets on granite slopes, Sierra Nevada, 6000 to 12,500 ft.; n. to B. C.; e. to the Rocky Mts.

218. J. parryi Engelm.; perianth and capsule x 5.

219. Juncus bufonius L.; *a*, habit x ½; *b*, perianth and capsule x 4½.

11. **J. bufónius** L. TOAD RUSH. Fig. 219. Stems 1 to 6 (or rarely to 10 or 14) in. high, terete, branching from the base, leafy; leaves narrow, usually revolute and bristleform; inflorescence a dichotomous cyme; flowers solitary

and remote to closely secund or even sub-capitate; perianth segments 1½ to 2½ lines long, long acuminate, greenish with white scarious margins, exceeding the capsule; capsule oblong, obtuse or truncatish.—A common species in wet places or dried up pools, throughout Cal. Very variable in size and aspect. Widely spread over the whole earth. Var. HALÓPHILUS Fer. & Buch. Stems stout, short; inner perianth segments obtuse, little if at all exceeding the capsule.—Santa Cruz Isl.

12. **J. sphaerocárpus** Nees. Very similar to no. 11 but smaller; stems densely tufted, 1½ to 2 in. high; branches 2 to 4-flowered; perianth segments subequal, equaling or exceeding the perianth; capsule elliptic or "globose."—Moist flats in the valleys or mountains. Cal. e. to Ariz. and n. to Ida. Rarely collected with us.

220. Juncus triformis Engelm.; *a*, habit x 1. *b*, Var. stylosus Engelm.; perianth and capsule x 9. *c*, Var. brachystilus Engelm.; perianth and capsule x 9. *d*, Var. uniflorus Engelm.; habit x 1; *e*, perianth and capsule x 10.

13. **J. trifórmis** Engelm. DWARF RUSH. Fig. 220. Stem almost none, bearing several erect filiform scape-like peduncles 2 to 4 in. high; leaves an inch or less long, filiform; flowers usually 3 to 7 in a small head; perianth brownish, 1 to 1½ lines long; segments narrowly lanceolate, acuminate, nearly equal, a little exceeding the 3 stamens and the capsule; capsule obovate, obtuse, apiculate; style exserted with elongated stigmas.—Mts., 200 to 6200 ft., North Coast Ranges and Sierra Nevada. Infrequent or overlooked. N. to Ore. and Wash. Var. STYLÒSUS Engelm. Fig. 220b. Styles very long.—Mariposa Co. Var. BRACHYSTÌLUS Engelm. Fig. 220c. Styles short.—North Coast Ranges, n. to Wash. Var. UNIFLÒRUS Engelm. Fig. 220d, e. Plants very small (¾ to 1 in. high); scapes 1-flowered.—Valleys or mountain flats, 200 to 6000 ft.

221. Juncus tenuis Willd.; *a*, infl. x 1; *b*, perianth and capsule x 7.

14. **J. ténuis** Willd. Fig. 221. Stems caespitose, slender, erect, 1 to 2 ft. high, leafy at base; leaves very fine, shorter than the stem; involucral bract exceeding the loose panicle; perianth segments pale, narrowly lanceolate, acuminate, 1¾ to 2 lines long, spreading in fruit and equaling or usually exceeding the ovate retuse greenish capsule; seeds with a white appendage at each end.—Dry valley flats, 50 to 4200 ft.; S. Cal. n. to Ore. A common species throughout the U. S. and W. Eur. Var. CONGÉSTUS Engelm. Inflorescence congested or subcapitate.—Cent. Cal. coast and middle altitudes in the Sierra Nevada.

15. **J. falcàtus** E. Mey. Fig. 222. Stems subterete or a little compressed, 6 to 9 in. high, more or less leafy, terete; rootstock slender, creeping; leaves usually equaling or exceeding the stems, 1½ lines wide, not ribbed by transverse septa; flowers in dense many-flowered terminal heads, the heads usually solitary; involucral bract about equaling the inflorescence; perianth segments 2 lines long, roughened, dark brown, with a broad green midvein; capsule triangularly ovate, obtuse, mucronate; seeds large (½ line long), with a whitish or as if membranous coat. — Coast region in sand dunes or sandy soil, from Monterey Co. to Humboldt Co.; n. to Alas.; Japan, Austr.

16. **J. obtusàtus** Engelm. Fig. 223. Stems subterete or a little compressed, 4 to 10 in. high, from a creeping rootstock, a little surpassing or about equaling the narrow (1 line broad) leaves;

222. Juncus falcatus E. Mey.; *a*, habit x ¼; *b*, infl. x ½; *c*, perianth and capsule x 3.

223. Juncus obtusatus Engelm.; *a*, habit x ½; *b*, infl. x ½; *c*, perianth and capsule x 3.

sheaths without ligules; involucral bract exceeding the inflorescence; heads 3 to 5-flowered, few in a simple panicle; perianth segments 1½ to 2 lines long, of equal length, the outer ovate, acute, brown margined, the inner very obtuse, white-scarious margined, shorter than the capsule; capsule oblong-ovate, obtuse or truncate, shortly apiculate.—Sandy banks of mountain streams: North Coast Ranges, 200 to 4000 ft.; Sierra Nevada, 4000 to 9600 ft. (Tuolumne Co. to Mariposa Co.); San Bernardino Mts.; n. to Wash.

17. **J. canáliculàtus** Engelm. Stems stout, terete, 2 to 3⅓ ft. high; herbage pale; leaves concave or channeled, almost equaling the stem; ligules present; panicle open, with 8 to 30 heads; heads 3 to 8 (or 12)-flowered; perianth light greenish red, 2½ lines long, the inner segments distinctly longer; anthers red-brown; style long, the stigmas long exserted; capsule ovate, beaked.—Stony stream banks or damp soil, from the foothills to 7500 ft., cismontane S. Cal. and desert slope of the San Bernardino Mts.; Ariz., L. Cal.

224. Juncus latifolius Buch.; *a*, infl. x 1; *b*, perianth and capsule x 6.

18. **J. longistỳlis** Torr. Stems tall (1 to 2 ft. high), subterete or slightly compressed; leaves shorter than the stems, the sheaths with ligules; heads densely (usually 2 to 6)-flowered in a short sparingly branched panicle, exceeding the very short involucral bract; perianth pale, segments of equal length, narrow, acuminate, broadly scarious-margined, 2 lines long; styles long; capsule equaling the perianth, triangular ovate, obtuse, mucronate.—Crest and e. side of the Sierra Nevada from Mariposa Co. n.; N. Mex., Col., and Neb. n. to Sask.

19. **J. latifòlius** Buch. Fig. 224. Similar to J. longistylis; leaves narrowly linear-lanceolate, 2 to 3½ lines broad, 2 to 5 in. long; ligules absent; heads 6 to 10-flowered, in a loose simple few-headed panicle. — Sierra Nevada from Tulare Co. n. to Siskiyou Co.; also Ore. and Wash.

20. **J. supìnifórmis** Engelm. Early leaves elongated and capillary, floating, pale green, 1 to 2 ft. long; stems low, erect, terete, shorter than the subterete cauline leaves; panicle simple, its 3 to 6 small heads about 5-flowered; perianth segments brownish, narrowly lanceolate, acute, nerved, 1½ to 2 lines long.—In ponds, Mendocino and Humboldt Cos.; n. to Wash.

21. **J. merténsiànus** Bong. Fig. 225. Stems very slender, compressed, from slender matted rootstocks, 3 to 6 (or 11) in. high; leaves very narrow, rather flattened, less than 1 line wide, finely but obscurely ribbed by transverse septa, the sheaths with ligules; heads solitary, densely many-flowered, dark brown; perianth 1 to 1½ lines long, the lanceolate narrowly acuminate segments equaling the obtuse obovoid capsule; anthers usually shorter than the filaments; seeds obliquely obovate, apiculate at apex, stipitate at base.—Higher mts., 4000 to 11,000 ft.: San Bernardino Mts.;

225. Juncus mertensianus Bong.; *a*, habit x ½; *b*, perianth and capsule x 5.

226. Juncus nevadensis Wats.; *a*, habit x ½; *b*, detail of leaf with ligule x 3; *c*, perianth and capsule x 6.

Sierra Nevada, n. to Modoc Co., thence w. to Del Norte Co.; n. to Alas., e. to Col.

22. **J. nevadénsis** Wats. Fig. 226. Resembling slender forms of J. phaeocephalus; stems very slender, somewhat compressed, from a slender creeping rootstock, ½ to 1 (or sometimes 2) ft. high; leaves teretish, very narrow (¼ to ½, rarely 1 line), more or less distinctly knotted by internal transverse partitions; ligules present; heads small, 2 to 7 in a short open panicle, sparsely flowered; perianth segments very dark brown, lanceolate, acuminate, 1½ to 2 lines long; anthers longer than the filaments; stigmas long exserted; capsule oblong, abruptly acute and beaked, nearly equaling the perianth.—Higher mts., 5000 to 9000 ft.: Sierra Nevada; s. to the San Jacinto and San Bernardino mountains; n. to B. C. Marked by its very narrow and erect strongly septate leaves with prominent ligules.

23. **J. bolánderi** Engelm. Fig. 227. Stems slender, terete, 1 to 2¾ ft. high, a little exceeding or about equaling the terete strongly knotted leaves; ligules conspicuous; heads subglobose, very dark, usually 2 or 3 in a close cluster, very many flowered; perianth segments reddish brown, narrowly lanceolate, acuminate and setaceous, 1½ lines long, exceeding the capsule; capsule clavate-oblong, obtuse, apiculate; seeds obovate, apiculate at each end.—Swamps, North Coast Ranges; sw. Ore. Var. RIPÁRIUS Jepson. Heads smaller, lighter-colored, 5 to 9 in a loose panicle; perianth segments less setaceous.—Lower Sacramento River.

227. Juncus bolanderi Engelm.; *a*, infl. x 1; *b*, perianth and capsule x 10.

24. **J. tórreyi** Cov. Fig. 228. Tall coarse plants with slender creeping rootstocks; stems stout, terete, 1¼ to 2 ft. or more high; leaves terete, straight and rigidly spreading, the transverse septa very distinct; ligules present; inflorescence terminal; flowers many in large dense heads which form a compact capitate cluster or condensed panicle, the cluster subtended by a long pointed sheath; perianth light brown, 4 to 5 lines long, its segments lanceolate-subulate, exceeding the narrow pointed golden capsule.—Damp places, S. Cal.; upper San Joaquin Valley, Inyo Co.;

228. Juncus torreyi Cov.; *a*, infl. x 1; *b*, perianth and capsule x 5.

n. to B. C., e. to the Atlantic. Well distinguished by its large dense heads, by its very narrow and rigid perianth segments and by its slender golden capsule.

25. **J. chlorocéphalus** Engelm. Fig. 229. Stems low and slender (8 to 15 in. high), terete, from a slender rootstock; leaves narrow (less than a line wide), the sheaths with ligules; heads 1 or 2, many flowered; perianth pale and scarious; segments 2 lines long, obtuse or acute; style exserted; capsule shorter than the perianth.—Sierra Nevada, 6400 to 8400 ft., from Nevada Co. to Mariposa Co.

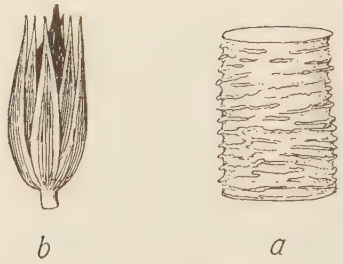
26. **J. dùbius** Engelm. Fig. 230. Stems very slender, compressed, 2 to 4 ft. high, from stout horizontal rootstocks; leaves narrow (1 line broad) but rigid, ⅔ to nearly as long as the stems, septate; panicle compound, diffuse,

230. Juncus dubius Engelm.; *a*, detail of leaf with ligule x 1; *b*, infl. x 1; *c*, perianth and capsule x 8.

229. Juncus chlorocephalus Engelm.; *a*, infl. x 1; *b*, perianth and capsule x 5.

3 to 12 in. long; heads 6 to 20-flowered, numerous; perianth brown or brownish, 1½ to 2 lines long, the segments lanceolate, acuminate; anthers elongated, rather exceeding the filaments; capsule narrowly oblong, acuminate, slightly longer than the perianth; seeds abruptly apiculate at each end, reticulate, brownish. — Montane, 3000 to 5000 ft.: Mariposa Co. to Sierra Co. The leaves suggest diminutive bamboo fishing rods.

27. **J. rugulòsus** Engelm. Fig. 231. Very closely allied in habit and character to J. dubius; stems slender, sometimes stout,



231. Juncus rugulosus Engelm.; *a*, detail of stem x 8; *b*, perianth and capsule x 8.

1½ to 3 ft. high, sharply and minutely transverse-rugulose; leaves strongly septate, attenuate into a flagellate-filiform tip; panicle 4 to 9 in. long; heads small, 4 to 6-flowered; perianth 1¼ to 1½ lines long, its segments oblong-lanceolate, acuminate; filaments 1½ to 2 times as long as the anthers; capsule oblong and acuminate, or lanceolate or broadly subulate, prismatically and sharply triangular, slightly exceeding the perianth.—Damp meadow land or marshes: s. Monterey Co.; s. Mohave Desert; cismontane S. Cal.

28. **J. oxýmeris** Engelm. Stems 1 to 2 ft. high, compressed, somewhat angled, erect, from an elongated horizontal rootstock, often stoloniferous; leaves broad and flat, equitant (1½ or) 2 to 3 lines wide, ligules not present, transverse partitions not conspicuous; involucral bract short; heads 5 to 10-flowered, set singly in a loose panicle; perianth segments brownish, linear-lanceolate, subulate, of equal length or the interior slightly longer; anthers 6, longer than the filaments; styles long exserted; capsule long attenuate, exceeding the perianth; seeds small, obovate, apiculate, light brown and finely reticulate.— Moist valleys and mountain flats, Coast Ranges and Sierra Nevada, 50 to 6000 ft.; n. to Ore.

29. **J. xiphioides** E. Mey. Fig 232. Stems flattened, 2-edged, 1½ to 3 ft. high; leaves equitant, more or less obviously septate, 1½ to 2½ lines wide, 6 to 14 in. long; panicle 2½ to 7 in. long; heads 6 to 11-flowered, discrete or more or less congested; perianth segments lanceolate, subulate-acuminate; stamens 6; stigmas barely exserted; capsule narrowly cylindric, abruptly acute or somewhat beaked, equaling or exceeding the perianth; seeds narrowly ovoid, apiculate.—Coastal region, salt marshes and moist lands: S. Cal. to Humboldt Co. and n. to Ore. Var. AURÀTUS Engelm. Stems slender, lower; heads yellow.—Solano Co. to Santa Clara Co.

232. Juncus xiphioides E. Mey.; *a*, infl. x 1; *b*, perianth and capsule x 8.

233. Juncus phaeocephalus Engelm.; *a*, infl. x 1; *b*, perianth and capsule x 8.

30. **J. ensifòlius** Wikstr. Similar to J. xiphioides; stems 1 to 2 ft. high; heads fewer, dense, dark-colored, many-flowered, 3 to 4 lines broad; perianth larger, dark brown, equaling the acute capsule; stamens mostly 3 (sometimes 6).—Wet granitic gravel, Sierra Nevada, 4000 to 9600 ft., n. to Siskiyou Co., thence sw. to Mendocino Co.; n. to Alas.

31. **J. phaèocéphalus** Engelm. Fig. 233. Stems ⅔ to 1½ ft. high, erect, leafy, ancipitally compressed, not winged, arising from stout elongated rootstocks; leaves ½ to 1½ lines wide, compressed, equitant, ribbed by transverse septa, sometimes very distinctly so; ligules none; flowers in terminal heads, the inflorescence usually barely exceeding the leaves; heads 1 to 3, solitary or 2 in a place; perianth dark brown, 1½ to 2 lines long; style long; stigmas exserted; capsule long acuminate, equaling or exceeding the perianth; seeds ovoid, the longitudinal ridges con-

234. Juncus phaeocephalus var. paniculatus Engelm.; *a*, infl. x ⅔; *b*, perianth and capsule x 5.

nected by similar transverse ones.—Meadows and borders of swamps, coast region from Los Angeles Co. to Mendocino Co. and n. to Ore. Var. PÁNICULÀTUS Engelm. Fig. 234. Stems 1 to 3 ft. high from a stout rootstock; heads few-flowered, many to numerous in a loose compound panicle; perianth segments very dark; styles long-exserted. — Valleys and mountain flats, Coast Ranges, Sierra Nevada, and cismontane S. Cal.

2. LUZULA DC. WOOD-RUSH

Plants of dry or high ground in open or shady or sometimes moist places. Stems hollow, leafy, simple, slender. Leaves softer and flatter than in Juncus, grass-like and often hairy or villous. Flowers in umbels or panicles or crowded in dense clusters or spikes. Capsule 1-celled; seeds 1 to 3. (O. It. luzziola, a glow-worm.)

Flowers solitary at the ends of the branches of the inflorescence.
- Pedicels divaricate.....1. *L. divaricata.*
- Pedicels erect.....2. *L. parviflora.*

Flowers crowded in spikes or dense clusters.
- Leaves flat.
  - Bracts and bractlets conspicuously fimbriate or ciliate.....3. *L. subcongesta.*
  - Bracts and bractlets not fimbriate.
    - Flowers in mostly rayed clusters..... 4. *L. campestris.*
    - Flowers in mostly solitary sessile spikes. 5. *L. subsessilis.*
- Leaves channeled; flowers in a dense nodding spike-like panicle.....6. *L. spicata.*

1. **L. divàricàta** Wats. Fig. 235. Stems 6 to 12 in. high, nearly naked, the leaves in a mostly basal tuft; herbage quite glabrous; inflorescence a diffuse cyme with divaricate branches and pedicels.—Sierra Nevada, 7000 to 11,000 ft.; Nev.

235. Luzula divaricata Wats.; *a*, habit x ¼; *b*, perianth and capsule x 4.

2. **L. parviflòra** Desv. Stems 1 to 2½ ft. high, usually rather leafy, densely leafy at base; leaves hairy at the sheaths; inflorescence lax, the branches of the cyme somewhat slender or racemose, distinctly though not strongly drooping; perianth segments greenish, acute, cuspidate, shorter than the acute shortly-beaked reddish capsule.—Coniferous woods: Sierra Nevada; far North Coast Ranges;

236. Luzula subcongesta; *a*, lower portion of plant x ⅔; *b*, infl. x ⅔; *c*, perianth and capsule x 7.

237. Luzula campestris DC.; *a*, habit x ¼; *b*, infl. x ¾; *c*, perianth and capsule x 4.

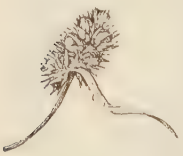
n. to Alas., e. to Lab.; Eur. Var. FÁSTIGIÀTA Buch. Inflorescence more or less corymbose; branches slender, only slightly or scarcely at all drooping.—Sierra Nevada from Mariposa Co. to Fresno Co., 6000 ft.

3. **L. subcongésta** Jepson. Fig. 236. Similar in habit to no. 2; pedicels very much shortened and the flowers in capitate clusters at the ends of the branches of the cyme; bracts and bractlets fimbriate; perianth dark reddish-brown, merely acute or membranously pointed; capsule dark or black.—Grassy spots amongst granite rocks, n. Sierra Nevada, 7000 to 8000 ft.

4. **L. campéstris** DC. COMMON WOOD-RUSH. Fig. 237. Stems erect, leafy, 8 to 15 in. high; herbage sparsely villous; leaf-blades 3 to 6 in. long, 2 to 3 lines wide, flat, a villous tuft at the throat, sparsely villous on the margins; bract foliaceous, shorter than or usually much exceeding the inflorescence; flowers spicate; spikes 3 to 4 lines long, erect, cymosely disposed, some on rays ¼ to 1 (or 2) in. long, some subsessile; bractlets scarious, hyaline and ciliate above; perianth segments lanceolate, acuminate, 1½ lines long, tinged with dark brown; seed dark, with a whitish conical appendage at one end ¼ to ½ as long.—Partially shaded spots, mt. and coast regions, 100 to 6000 ft.; N. Am., Eur., Asia. Var. CONGÉSTA Buch. Spikes several, congested into a pyramidal or conical head; perianth often dark-brown. —Coast, Monterey Co. to Humboldt Co. Var. SUDÉTICA Celak. Inflorescence congested; perianth almost black. —Mineral King; Eur.

5. **L. subséssilis** Buch. Fig. 238. Erect or ascending, 5 to 12 in. high; spikes solitary or rarely 2 in a place, sessile or nearly so, 2½ to 4 lines long.—Cent. Cal. coast; n. to B. C.

6. **L. spicàta** DC. Fig. 239. Densely tufted 4 to 12 in. high, without rootstocks; leaves narrowly linear, channeled; flowers in sessile clusters, forming a spike-like panicle; panicle nodding, sometimes interrupted, ½ to ¾ in. long; perianth segments bristle-pointed, equaling or exceeding the bluntly acute capsule. — High mts., Sierra Nevada, 9000 to 12,500 ft.; n. to Alas., e. to N. Eng.; Eur., Asia.



238. L. subsessilis Buch., infl. x 1.

LILIÀCEAE. LILY FAMILY

Perennial herbs, the stems from bulbs or rootstocks, or rarely shrubs or trees. Leaves all basal and the stem a scape, or the stem more or less leafy and frequently branching. Flowers regular and perfect; perianth with 6 segments or lobes, the 3 outer and 3 inner petaloid and alike (or nearly) in shape and color, or sometimes strongly differentiated; when strongly differentiated by shape or color the outer 3 are called sepals and

239. Luzula spicata DC.; *a*, habit x ⅔; *b*, perianth and capsule x 7.

the inner 3 petals. Stamens 6, sometimes 3 or 4. Ovary superior, 3-celled; styles 3, or 1 and entire or 3-cleft; stigmas 3, rarely 1. Fruit a capsule or berry.—Maianthemum has a 2-merous flower, Scoliopus a 1-celled ovary, Veratrum polygamous flowers, and Smilax dioecious flowers. Cauline leaves alternate, or sometimes whorled in Fritillaria and Lilium, netted-veined and whorled in Trillium. Our genera of Liliaceae as a whole are plants of grassy plains and foothills characterized by a two-season year, that is with a rainy or vegatative period regularly succeeded by a rainless or hibernation period. During the hibernation period the entire plant dries up or perishes except the below-ground corm or bulb. The most typical genera of the semi-arid or desert areas are Hesperocallis, Chlorogalum, Bloomeria, Brodiaea and Calochortus. The two latter genera have developed, especially in the upper Sonoran zone, a large number of species.

A. Fruit a capsule.

1. Perennial herbs.

Styles 3 and distinct (except no. 1); plants with rootstocks (except nos. 4 and 5); perianth segments distinct.
- Leaves equitant.
  - Stamens with densely woolly filaments; flowers in a loose raceme..... 1. Narthecium.
  - Stamens not woolly; flowers in a head or capitate raceme.....2. Tofieldia.
- Leaves not equitant.
  - Stem glabrous, the leaves mostly basal.
    - Perianth segments not glandular.
      - Leaves very dry and sedge-like, rough-edged; flowers not nodding.... 3. Xerophyllum.
      - Leaves not sedge-like; flowers nodding.....4. Stenanthium.
    - Perianth segments glandular near the base.....5. Zygadenus.
  - Stem pubescent (at least above), very leafy.....6. Veratrum.

Style 1, entire, or 3-lobed or 3-parted, or none; plants with bulbs (except no. 7).
- Stems from a tunicated bulb or corm, or rootstock in no. 7.
  - Flowers with bracts.
    - Flowers in racemes or panicles.
      - Perianth segments united below into a tube.
        - Flowers in a cluster on the ground; anthers basifixed..... 7. Leucocrinum.
        - Flowers borne on a more or less leafy stem.
          - Perianth segments ascending; anthers versatile..... 8. Hesperocallis.
          - Perianth segments reflexed; anthers basifixed..... 9. Odontostomum.
      - Perianth segments distinct, withering-persistent; leaves basal; anthers versatile.
        - Flowers in a raceme.
          - Raceme dense; perianth 2½ to 5 lines long..... 10. Schoenolirion.
          - Raceme loose; perianth about 1 in. long.....11. Camassia.
        - Flowers in a panicle.....12. Chlorogalum.
    - Flowers in umbels or heads.
      - Perianth segments distinct or nearly so; anthers versatile.
        - Filaments not appendaged, often dilated at base.
          - Umbel in the bud sheathed by a continuous spathe splitting into 2 or 3 bracts; bractlets none.....13. Allium.
          - Umbel in the bud covered by 3 distinct bracts; pedicels with minute bractlets.....14. Muilla.
        - Filaments arising from a cup-like or winged appendage..... 15. Bloomeria.
      - Perianth segments united below into a tube; stamens with anthers 6 or 3; anthers basifixed or versatile.....16. Brodiaea.
  - Flowers without bracts; leaves 1 or few, basal or mostly so; anthers basifixed.
    - Perianth segments unlike, the inner very showy, usually with a glandular pit at base; leaves narrow.....17. Calochortus.
    - Perianth segments alike or nearly so, colored alike, without glandular pits; leaves broad.....18. Erythronium.
- Stems from a scaly bulb.
  - Perianth campanulate to funnelform; anthers attached at base or below the middle; style 3-cleft or rarely entire.....19. Fritillaria.
  - Perianth commonly funnelform; anthers versatile; style entire.....20. Lilium.

2. Shrubs or trees.

Flowers rather large; fruit not winged.....21. Yucca.
Flowers minute; fruit 3-winged.....22. Nolina.

B. Fruit a berry (except nos. 29 and 30); plants with rootstocks.

Flowers perfect; stems not prickly.
- Leaves reduced to scales; branchlets filiform.....23. Asparagus.

Leaves foliaceous.
Plants with leafy stems; stamens 6.
Stem branching; flowers few, drooping.
Flowers axillary; filaments short, flattened.....24. STREPTOPUS.
Flowers terminal; filaments thread-like.....25. DISPORUM.
Stem simple; flowers many or numerous in a terminal raceme or panicle...
26. SMILACINA.
Plants with only 2 or 3, or at most few leaves.
Perianth segments and stamens 4; leaves 2 or 3.....27. MAIANTHEMUM.
Perianth segments 6.
Leaves basal, parallel-veined.
Stamens 6; leaves 5.....28. CLINTONIA.
Stamens 3; leaves 2.....29. SCOLIOPUS.
Leaves 3 in a single whorl at summit of stem, netted-veined; flower 1; stamen 6.....30. TRILLIUM.
Flowers dioecious; stems prickly; leaves with climbing tendrils.....31. SMILAX.

1. **NARTHÈCIUM** Moeh. BOG ASPHODEL

Stems scape-like, with a dense tuft of basal leaves borne on a creeping rootstock. Leaves narrowly linear and equitant, the cauline few and small. Flowers yellowish-green, in a terminal raceme. Pedicels with a bractlet at the middle. Perianth with 6 distinct segments. Stamens 6, the filaments densely woolly, except at the very base. Ovary attenuate upward to the scarcely lobed stigma. Capsule loculicidal, with thin-chartaceous walls. Seeds numerous with a long bristle-like point at each end. (Narthex, Greek name of Ferula, the stems of which were used as rods; applied here on account of the scapose stems.)

1. **N. califórnicum** Baker. Stems 18 to 22 in. high; basal leaves iris-like, 4 to 10 in. long, 1½ to 2 lines wide, the cauline 2 or 3, 1 to 4 in. long; raceme loose, 3½ to 7 in. long; perianth segments oblong-linear, narrowed upward or acute, 3 to 4 lines long; anthers brick-red; ripe capsules salmon-color; seeds, including the points or tails, 5 lines long.—Marshy ground: North Coast Ranges from Mendocino Co. to Del Norte and Trinity Cos.; Sierra Nevada from Plumas Co. to Fresno Co.; sw. Ore.

2. **TOFIÈLDIA** Huds.

Stems simple, naked above, arising from a slender rootstock. Leaves linear, sedge-like, equitant, mostly in a basal tuft. Flowers small, white or greenish-white, ours borne by 3s in a head or dense capitate raceme. Pedicels (in ours) with a membranous 3-lobed involucre above the middle or at the summit. Perianth segments 6, distinct, spreading, persistent. Stamens 6. Ovary 3-lobed; styles 3, short, distinct. Capsule obovate, acute, beaked by the spreading persistent styles, septicidal. Seeds with a membranous coat, in ours tailed at one end. (Tofield, English botanist, of Doncaster, a correspondent of Hudson.)

1. **T. óccidentàlis** Wats. Stems ½ to 2 ft. high, glandular; leaves 2 to 12 in. long, 1 to 3 lines wide; racemes ½ to 1 in. long; perianth segments oblong, 1½ to 3 lines long; filaments lanceolate; capsule 3 to 4 lines long; seeds with a loose cellular coat, appendaged at the free end with a tail as long or somewhat longer than the body.—Mt. bogs, 3500 to 7500 ft.: North Coast Ranges from Mendocino Co. n. to Siskiyou Co., thence s. in the Sierra Nevada; n. to B. C.

3. **XÈROPHÝLLUM** Michx.

Stem simple, stout and leafy, ending above in a many-flowered raceme, and arising from a tuber-like woody rootstock bearing cord-like roots, the basal leaves in a dense tuft, numerous, narrowly linear and elongated, dry, rough-edged. Flowers white or cream-color, on slender white pedicels. Perianth segments 6, distinct, several-nerved, persistent. Stamens 6. Ovary 3-lobed; styles 3, distinct. Capsule chartaceous, loculicidal, or occasionally also septicidal. Seeds 2 to 4 in each cell. (Greek xeros, dry, and phullon, leaf, the foliage very hard and dry.)

1. **X. tènax** (Pursh) Nutt. ELK GRASS. FIRE-LILY. Fig. 240. Stem 2 to 6 ft. high; basal leaves 1¼ to 3 ft. long, 1 to 3 lines wide; raceme dense, ½ to 1½ ft. long; pedicels 1 to 2 in. long, each with a scarious bract at base,

240. Xerophyllum tenax Nutt.; *a*, raceme x ½; *b*, pistil x 4.

spreading in flower, past anthesis strictly erect, spreading again in fruit; perianth segments linear-oblong, 4 lines long, the stamens a little longer.—Dry ridges: Monterey and n. in the Coast Ranges to Del Norte Co., where it is very common; Sierra Nevada from Placer Co. n. to Siskiyou Co.; n. to B. C. and Mont. The plants commonly bloom only after 5 to 7 years of preparation. May-July. The fibres of the leaves were employed by the Hupas and other native tribes for making garments and for decorative work in baskets, while the bulbous rootstocks, when roasted, furnished a nourishing food. Also called Squaw-grass, Bear-grass, Turkey-beard, Bear-Lily, and Pine-Lily.

4. **STENÁNTHIUM** Kunth.

Stem from a tunicated bulb, the narrow leaves mostly basal. Flowers (in ours) in a simple raceme, nodding. Perianth purplish green, its segments narrow, acuminate. Stamens 6, much shorter than and inserted on the base of the perianth segments; anthers reniform, 1-celled. Ovary ovoid; styles 3. Capsule septicidal, 3-beaked. Seeds winged. (Greek stenos, narrow, and anthos, flower.)

1. **S. óccidentàle** Gray. Stem 6 to 11 in. high; leaves linear, tapering to base and apex, 4 to 7 in. long, 2 to 7 lines wide; perianth narrow-campanulate, 5 lines long, its tips recurved.—High montane in Trinity Co.; n. to Alb.

5. **ZYGADÈNUS** Michx. Zygadene

Stem simple, scape-like, in ours from a tunicated bulb. Outer coats of the bulb mostly dark or black. Herbage glabrous and somewhat glaucous. Leaves linear, mostly basal. Flowers erect, greenish-white, in a raceme or panicle. Perianth nearly rotate, withering-persistent; segments ovate to oblong-lanceolate, with a green glandular spot at the narrow or shortly clawed base. Stamens 6, free from the segments. Styles 3, distinct, persistent. Capsule deeply 3-lobed. (Greek zugon, a yoke, and aden, a gland.)

Raceme narrow, simple; inner segments spathe-like, the margins abruptly infolded just above the claw.....1. *Z. venenosus.*
Raceme broader, more or less compound.
Perianth segments with central area slightly depressed, the border more or less undulate; lower flowers often staminate; bracts membranous.
Leaves narrow (3 to 5 lines wide); stamens longer than or equaling the perianth; anthers yellow.....2. *Z. paniculatus.*
Leaves ¾ to 1 in. wide; stamens shorter than the perianth; anthers white.....3. *Z. exaltatus.*
Perianth segments plane; flowers generally all perfect.
Segments ovate-lanceolate, the outer only shortly clawed; bracts more or less green, conspicuous.....4. *Z. fremontii.*
Segments broadly elliptic, all short-clawed; bracts membranous, very small....5. *Z. brevibracteatus.*

1. **Z. venenòsus** Wats. Death Camas. Plants ⅔ to 2 ft. high; bulb oblong-ovate, ⅛ to ½ (or ¾) in. broad; leaves narrowly linear, 1 to 3 lines broad, carinate and usually folded, more or less scabrous; raceme commonly simple and narrow, 3 to 5 or 10 in. long, the bracts lanceolate, long-attenuate or even flagellate, much exceeding the buds and about as long as the pedicels; perianth segments deltoid-ovate to oblong, 1½ to 2 lines long, the outer broader and with a shorter claw or sessile; gland seated above the claw, furnished with a more or less evident circular ridge or thin crest, the crest on the lower side continuous with the spathe-like infolding of the basal margins of the blade; stamens about equaling the segments, somewhat adnate below; anthers white; capsule 4 to 5 (or 7) lines long.—Wet meadows: Coast

Ranges, mostly near the coast; Sierra Nevada, both e. and w. slopes; S. Cal.; n. to B. C. Var. MICRÁNTHUS Jepson. Raceme more open and broader (pedicels ¾ to 1 in. long), the bracts relatively shorter; flowers usually larger, less delicate, ridge about the gland thickened, outer segments often not clawed.—North Coast Ranges and s. to Contra Costa Co. This sometimes approaches Z. fremontii in habit, but the gland is more sharply defined than in that species.

2. **Z. pániculàtus** (Nutt.) Wats. SAND-CORN. Plants 8 to 16 in. high; leaves all sheathing; main raceme with short dense supplementary racemes below; bracts ovate-lanceolate; perianth segments deltoid-ovate, acute or acuminate, greenish thickened on the back at base, the claws very short or sometimes nearly none; gland seated above the claw, indefinitely margined, sometimes spreading nearly to the middle of the segment; stamens much exserted or at least equaling the segments; anthers yellow; capsule ½ to 1 in. long.—Sagebrush hills e. of the Sierra Nevada crest from Nevada Co. to Siskiyou Co.; Nev. to Wash. and Mont.

3. **Z. exaltàtus** Eastw. Plants 2⅔ to 3½ ft. high; bulb oblong-ovoid, 2 to 3 in. long; basal leaves large (¾ to 1¼ in. wide), in a conspicuous sheathing tuft; main raceme 8 to 12 in. long, with 3 to 5 supplementary racemes below, the lower bearing only staminate flowers; bracts ovate-lanceolate; perianth segments oblong-elliptic, with claws; gland extending the length of the claw, bordered on each side by a narrow non-glandular area and terminating upon the base of the blade in a somewhat darker rounded area toothed above; stamens shorter than the perianth; anthers dull white; capsule ¾ in. long.—Sierra Nevada, from Calaveras Co. to Tulare Co., about 2000 to 4000 ft.

4. **Z. fremóntii** Wats. STAR ZYGADENE. Plants 1¼ to 2¼ ft. high; bulb globose or broadly oblong, ½ to 1¼ in. broad; basal leaves 8 to 16 (or 20) in. long, 5 to 9 (or 13) lines broad, usually somewhat falcate-curving, the cauline few and shorter; main raceme with supplementary racemes below; perianth segments ovate-lanceolate, 3 to 7 lines long, the outer broader and clawed, at least shortly so, the inner contracted to a longer and narrower claw; gland seated on base of blade, greenish yellow, toothed above; stamens about half as long as the segments; anthers white; capsule oblong, 6 to 10 lines long.—Deep soil on bushy hillsides: Coast Ranges, s. to S. Cal. Common and variable. Apr.-June. Var. INEZIÀNUS Jepson n. var. Perianth segments more distinctly rotate; gland green.—Santa Ynez Mts. (Jepson 9122, type). Var. MÌNOR Jepson. Plants 4 to 8 in. high; raceme simple, short, broad, with few flowers.—An early form near the coast. Mar. Var. SÁLSUS Jepson. Fig. 241. Very stout, ¾ to 1 ft. high; basal leaves in a conspicuous sheathing tuft; glands lighter in color.—Alkaline flats, Solano Co.

241. Zygadenus fremontii Wats. var. salsus Jepson; *a*, habit x ⅛; *b*, fl. x ½.

5. **Z. brévibrácteàtus** Hall. Plants 15 to 22 in. high; bulb round-ovoid, 1 to 1¼ in. broad; basal leaves 6 to 8 in. long, ¼ in. broad, linear, somewhat revolute and falcate-curving; raceme loose, its pedicels ½ to 1¼ in. long, widely or horizontally divaricate; supplementary basal racemes 1 or 2, rigid, widely spreading; perianth segments 2 to 3 lines long, distinctly short-clawed, the outer rhomboidal-ovate, the inner a little narrower; gland green, extending just above the claw, its lower margin bounded by a sharp low ridge; stamens ⅔ the length of segments; capsule 7 to 8 lines long.—Sandy mesas, w. and s. borders of the Mohave Desert.

6. VERÀTRUM L.

Stem tall and leafy from a short thick rootstock, bearing coarse fibrous roots. Leaves broad, plaited, coarsely nerved. Stem and inflorescence pubescent. Flowers polygamous, greenish or cream-color, in a terminal panicle. Perianth of 6 distinct obovate-oblong segments, somewhat contracted at the base, adnate to the base of the ovary. Stamens 6, opposite the perianth segments and free from them, shorter by half and recurving; filaments subulate; anthers with confluent cells, cordate. Styles 3, persistent, mostly curved. Capsule 3-celled, 3-lobed. (Latin vere, truly, and ater, black, in reference to the color of the roots.)

Ovary glabrous.
Perianth segments not fringed; capsule oblong-ovoid, ⅞ to 1¼ in. long.
Flowers dull white; common.....1. *V. californicum.*
Flowers green; rare.....2. *V. viride.*
Perianth segments deeply fringed; capsule depressed-globose with notched apex, much-lobed laterally, 4 lines long.....3. *V. fimbriatum.*
Ovary densely woolly; perianth segments erose or lightly fringed.....4. *V. insolitum.*

1. **V. californicum** Durand. Corn Lily. Stem very stout and leafy, suggesting a cornstalk, 3 to 5 or 6 ft. high; leaves ovate or elliptic-oblong, sheathing at base, 6 to 12 in. long or the uppermost lanceolate and shorter; panicle 1 to 1⅓ ft. long, the lower portion often sterile; bracts mostly membranous; pedicels 1 to 4 lines long; flowers dull white; perianth segments obovate, mostly obtuse, 5 to 9 lines long, greenish margined at base, greenish glands at base of segments 2, or one and Y-shaped, often denticulate or erose at apex; capsule walls firm-chartaceous; seeds broadly wing-margined.—Wet flats and about springs, a characteristic plant of meadows in the Sierra Nevada at 4500 to 8500 ft.; also in the North Coast Ranges and high mts. of S. Cal.; n. to Wash., e. to Col. and s. to Mex. Often reported as poisonous to stock and sometimes called False Hellebore. July-Aug.

2. **V. víride** Ait. Similar to no. 1 in habit; branches of the panicle more or less drooping; principal bracts foliaceous; perianth green, about 4 lines long.—Subalpine meadows, Siskiyou Co.; n. to Alas., e. to N. B., thence s. to Georgia.

3. **V. fimbriàtum** Gray. Similar in habit to the preceding; leaves linear-lanceolate, ½ to 1½ ft. long, 1 to 2 or 4 in. wide; panicle ½ to 1¾ ft. long, its branches widely spreading; pedicels 4 lines long; perianth segments rhombic-ovate, 2 to 5 lines long, the margin cleft into filiform segments, except at the broad base which bears two oblong more or less glandular spots reaching to the middle of the segment and separated by a furrow; capsule walls membranous; seeds green, scarcely margined.—Vicinity of the coast, Mendocino "White Plains" or pine barrens. July.

4. **V. insólitum** Jepson. Stems 4 to 5 ft. high; leaves elliptic, acute, 7 to 8 in. long, the uppermost lanceolate, 6 to 7 in. long or less; panicle 11 to 20 in. long, composed of elongated lanate-tomentose racemes; perianth segments white, 3 to 4 lines long, obovate, mostly obtuse, irregularly ciliate or erose or shallowly fimbriate, all with 2 dark glandular spots at base; ovary densely woolly; capsule unknown.—Red-clay hills, in chaparral, Del Norte Co. Also west fork Illinois River, s. Ore.

7. LEUCOCRÌNUM Nutt.

Leaves tufted on a very short rootstock, the roots cord-like. Flowers showy, pure white, fragrant, in a central cluster on the ground, the pedicels arising directly from the rootstock. Perianth persistent, salverform, its tube slender, very much elongated, its segments oblong-lanceolate. Stamens 6, inserted near the summit of the tube. Ovary ovate-oblong, seated below the ground at the base of the perianth-tube; style 1, persistent, elongated, tubular, the orifice slightly 3-lobed. Capsule triangular-obovate, loculicidal. Seeds angled, black. (Greek leucos, white, and krinon, a lily.)

1. **L. montànum** Nutt. Sand Lily. Leaves linear, many-nerved, 3 to 5 in. long, ½ to 2½ lines broad, the bases surrounded by scarious bracts; pedicels 2 to 6 lines long; perianth segments oblong, 7 to 9 lines long, the tube 2 to 5 in. long.—Mt. valleys, n. Sierra Nevada from Sierra Co. to Modoc and Siski-

you Cos., 4000 to 5000 ft. Plentiful in its special localities but the localities few. Ore. and Nev. to Neb.

8. **HÉSPEROCÁLLIS** Gray

Stem straight, simple, somewhat leafy, arising from a tunicated bulb. Leaves narrow. Flowers in a raceme, with conspicuous scarious bracts and pedicels jointed at the summit. Perianth white, withering-persistent, funnelform, 6-cleft into narrowly obovate segments. Stamens 6, inserted on the throat. Style equaling the perianth or slightly exserted; stigma disk-shaped. Capsule subglobose, loculicidal. Seeds numerous, horizontal, flattened, in 2 rows in the cells, jet black. (Greek hesperos, western, and kallos, beauty.)

1. **H. undulàta** Gray. DESERT LILY. Stem 1 to 2 ft. high, 4 to 18-flowered; basal leaves somewhat fleshy, carinate, wavy-margined, 1 to 2 ft. long and ¼ to ¾ in. wide, the margin more or less undulate; cauline leaves few, shorter; perianth 2¼ to 2¾ in. long, its tube half as long as the segments, the segments narrowly obovate, 4 to 6 lines wide, with a broad 5 to 7-lineate bluish-green band on the back; capsule 6 to 10 lines long, abruptly tipped with the persistent style base.—Sandy valleys or rocky hills: e. Mohave Desert; Colorado Desert; w. Ariz. Mar.-Apr.

9. **ÒDONTÓSTOMUM** Torr.

Stem flexuous, branching, from a depressed corm. Leaves linear, mostly basal, sheathing the stem. Flowers in bracted racemes. Perianth with a narrow tube, its segments 6, soon reflexed. Stamens 6, inserted on the throat and alternating with as many short staminodia; the stamen opposite the lower outer segment stands alone and faces the remaining 5, which approximate each other on the upper side of the flower. Style 1; stigmas 3. Ovules 2 in each cell but only 1 maturing. Capsule obovate, 3-lobed, loculicidal. (Greek odous, tooth, and stoma, mouth, on account of the erect subulate filaments at the throat of the flower.)

242. Odontostomum hartwegii Torr.; fl. x 3.

1. **O. hartwégii** Torr. Fig. 242. Erect, 5 to 10 in. high; basal leaves 3 to 9 in. long, 2 to 5 lines wide, with caudate-attenuate apex; racemes 2 to 5 in. long; bracts and bractlets subulate; perianth-tube 2 to 3 lines long, the reflexed segments as long or a little longer, narrowly oblong, 5 or 6-nerved.—Dry hard soil, 400 to 1300 ft.: Sierra Nevada foothills from Mariposa Co. to Shasta Co.; local in the foothills of the middle and inner North Coast Ranges (Napa Co. and Tehama Co.). May.

10. **SCHOÈNOLÍRION** Torr.

Stem simple, scapose, this and the linear-elongated leaves from a tunicated bulb. Raceme elongated, densely many-flowered, with 1 or 2 short supplementary racemes below. Flowers on very short pedicels jointed at the summit. Perianth white, becoming scarious, persistent; segments 6, distinct, oblong, 3-nerved. Stamens 6, adnate to the base of the perianth segments. Ovary ovate, short-stipitate, the cells 2-ovuled. Style persistent; stigma 3-cleft. Capsule loculicidal; seeds black. (Greek schoinos, a rush, and lirion, a lily.)

Outer bulb-coat fibrous; perianth segments linear-oblong, ... 1. *S. album.*
Outer bulb-coat membranous; perianth segments lanceolate ..... 2. *S. bracteosum.*

1. **S. álbum** Dur. Scape ¾ to 5 ft. high; leaves flat, ½ to 2 ft. long, 2 to 6 lines wide; perianth white, tinged or tipped with green, pink or lilac, its segments linear-oblong, obtuse, 2½ to 3 lines long; stamens about equaling the perianth; ovary slightly 6-lobed; style slightly 3-cleft; capsule globose-ovate, 3 lines long.—Mt. swamps, n. Sierra Nevada from Plumas Co. to Mt. Shasta, thence sw. to Mendocino Co.; 3500 to 7000 ft.; s. Ore. Apr.-July.

2. **S. bracteòsum** (Wats.) Jepson. Habit similar to S. album; perianth segments dull white, lanceolate, acuminate, 4 to 5 lines long, the stamens

about half as long.—Bogs and stream banks, n. boundary of Del Norte Co. and adjacent Ore.

11. **CAMÁSSIA** Lindl.

Stem slender, scapose, arising from a tunicated bulb, the linear leaves basal. Flowers dark blue or nearly white, in a simple raceme. Bracts scarious. Pedicels jointed at the summit. Perianth segments 6, distinct, oblanceolate, nerved, somewhat spreading. Stamens 6, on the base of the perianth, shorter than the segments. Style filiform, slightly 3-cleft at apex, the lower part persistent. Capsule 3-lobed, loculicidally 3-valved. Seeds several in each cell. (Quamash or camass, the name used by the northwest Indians.)

Perianth segments 3 or sometimes 5-nerved; buds gibbous on one side.....1. *C. quamash.*
Perianth segments usually 5 (or 7 to 9)-nerved; buds not gibbous.....2. *C. leichtlinii.*

1. **C. quàmash** (Pursh) Greene. Camass. Scape stoutish, 1 to 2½ ft. high; raceme 5 to 25-flowered; flowers dark blue, rarely white; perianth segments unequal, spreading unequally in 2 sets of 3 each, nearly 6 to 10 lines long, each twisted separately after blooming; capsule obtusely angled, its valves pinnately veined.—Wet meadows or wet bottoms, Sierra Nevada, 4500 to 6500 ft.; high North Coast Ranges.; n. to B. C. and e. to Utah.

2. **C. leichtlínii** (Baker) Wats. Similar to C. quamash; flowers dark blue to cream color; perianth segments 10 to 12 lines long, spreading regularly in a perfect star, withering and twisting over the capsule like a bon-bon, at length deciduous as a whole; capsule oblong-obovate, slightly notched at apex, its valves closely veined horizontally.—Wet flats or grassy plains, Marin and Napa Cos. to Humboldt Co., and e. to Sierra Co.; n. to B. C.

12. **CHLORÒGALUM** Kunth.

Stem from a tunicated bulb, often tall, almost leafless, ending in a panicle of racemose branches. Leaves of the basal tuft long-linear. Bracts small and scarious. Pedicels jointed at the summit. Perianth white, purple or pinkish, persistent and at length twisted over the ovary; segments 6, distinct, spreading, ribbon-like, with 3 distinct but closely approximate nerves down the middle. Stamens 6, rather shorter than the segments and inserted on their bases. Style long-filiform, slightly 3-cleft at apex. Capsule broadly turbinate, 3-lobed, loculicidal, with 1 or 2 seeds in each cell. (Greek chloros, green, and gala, milk or juice.)

Perianth segments rotate-spreading, 8 to 10 lines long; bulb with a heavy coat of coarse fibers; leaves ½ to 1½ in. broad; pedicels 3 lines long or more.....
1. *C. pomeridianum.*
Perianth segments somewhat spreading from above the base, 3 to 5 lines long; bulb with a membranous coat; leaves ¼ in. wide or less.
Pedicels shorter than the perianth; flowers white or pinkish.
Flowers white with yellowish-green lines; style included; ovary on a short stipe..
2. *C. angustifolium.*
Flowers white with rose-colored midnerve or pinkish; style exserted as ovary matures; ovary sessile.....3. *C. parviflorum.*
Pedicels as long or longer than the perianth; flowers blue or purplish; ovary sessile..
4. *C. purpureum.*

1. **C. pòmerídiànum** (Ker) Kunth. Soap Plant. Plants 2 to 10 ft. high, with ample spreading panicle; bulb 3 to 4 in. long and 1½ to 2 in. thick with a very dense coat of coarse brown fibers; basal leaves numerous, ¾ to 2½ ft. long, ½ to 1½ in. broad, carinate, strongly undulate; pedicels slender, about 3 to 6 lines long; perianth segments linear, 8 to 10 lines long, white, purple-veined, spreading widely; capsule 3 lines long, the valves pinnately nerved.—Dry open low hills and plains, Sierra Nevada foothills, Great Valley, Coast Ranges, s. to cismontane S. Cal. and n. to s. Ore. Absent from the Colorado and Mohave deserts and the arid region e. of the Sierra Nevada, and from the Redwood belt. July-Aug.

2. **C. angustifòlium** Kell. Plants 1⅛ to 2 ft. high; bulb-coats membranous, light reddish-brown; basal leaves 4 to 12 in. long, 1 to 2 or 3 lines broad, becoming revolute; panicle with few ascending branches; pedicels about 2 lines long; perianth funnelform-campanulate, the segments oblong-linear, 4 to 5 lines long, white with yellowish-green veins; ovary on a short stipe.—Lower

foothills of the Sierra Nevada, Calaveras Co. n. to Shasta Co., thence s. in the inner Coast Range to Mendocino Co.

3. **C. parviflòrum** Wats. Plants 1 to 2 ft. high; bulb 1 in. in diameter; basal leaves grass-like (2 to 3 lines broad); pedicels short, 1 or rarely 2 lines long; flowers pinkish or white with rose-colored midnerve; perianth segments oblong-lanceolate, spreading from above the base, 3 or sometimes 4 lines long; style exserted as ovary matures; ovary broad and obtuse, sessile.—Cismontane S. Cal. in Riverside and San Diego Cos., from the coast inland 24 to 35 miles.

4. **C. purpureum** Brandegee. Plants 14 to 20 in. high; bulbs light-colored, ovoid, ¾ to 1 in. in diameter; basal leaves narrowly linear, 1 to 2 lines wide, undulate; pedicels as long or longer than the (3 lines long) perianth; perianth segments spreading from above the base, oblong-ovate, blue or purplish with 3 darker midveins; stamens about equaling the segments; style sometimes slightly exserted in old flowers; ovary sessile.—W. Monterey Co. June.

13. ÁLLIUM L. Wild Onion

Stem scapose, from a tunicated or sometimes rhizome-like bulb or from a corm, with basal leaves, and bearing an umbel or head of flowers subtended by 2 or 3 thin whitish or scarious bracts. Herbage with the characteristic taste and odor of onions. Leaves narrow and plane, or convolute-filiform or terete. Perianth of 6 distinct or nearly distinct equal 1-nerved segments, campanulate or spreading. Stamens inserted on the base of the segments; filaments often dilated below. Ovules 2 (rarely several) in each cell; style filiform, persistent; stigma simple or 3-parted. Capsule obovate or globose, obtusely 3-lobed, often crested; seeds 1 or 2 in each cell, black, wrinkled. (Ancient Latin name of garlic.)

A. Scape terete; leaves 1 to several, linear, filiform or terete.

1. *Plants with rootstocks and bulbs* (corms in no. 3 and no. 20).

Rootstock crowned by the bulb, more or less persistent; bulb narrowly oblong or elongated ovoid, heavily sheathed with the bases of several leaves.
Scapes 1½ to 3 ft. high; bulbs white or light-colored, narrowly oblong, ½ to 1¼ in. broad.....1. *A. validum.*
Scapes 8 to 12 in. high; bulbs generally deep red, elongated ovoid, ½ to ¾ in. broad.....2. *A. haematochiton.*
Rootstock slender, horizontal, bearing terminally one or few corms and giving rise to an erect scape; corm short-ovoid or round.....3. *A. unifolium.*

2. *Plants without rootstocks; bulb ovoid or globose; leaves deciduous above outer bulb-coats.*

Bulb-coats with indistinct reticulation or none.
Leaves terete or sub-terete, solid; ovary crests conspicuous.
Scapes 12 to 20 in. high; bulbs pinkish; leaves 1 or 2.....4. *A. intactum.*
Scapes 2 to 8 in. high; bulbs reddish-brown; leaf solitary.
Leaves not coiled at tip; S. Cal.
Perianth segments lanceolate-attenuate; ovary crests emarginate.....5. *A. parryi.*
Perianth segments ovate-lanceolate; ovary crests more or less fimbriate.
Scapes mostly slender; perianth segments 3 to 5 lines long, usually recurved at tip, sometimes spreading; mostly of the desert slopes.....6. *A. fimbriatum.*
Scapes stout; perianth segments closely erect, straight at tip, 6 to 7 lines long; high San Gabriel Mts.....7. *A. peirsonii.*
Leaves coiled at tip; east side of the Sierra Nevada.....8. *A. atrorubens.*
Leaves plane.
Scapes 4 to 15 in. high; ovary crests conspicuous; perianth segments broadly ovate to lanceolate.
Flowers 5 to 6 lines long; ovary crests twice as long as the ovary.....9. *A. anserinum.*
Flowers 3 to 4 lines long; ovary crests shorter than the ovary.
Perianth segments acuminate, rose-color.
Scapes solitary.....10. *A. campanulatum.*
Scapes commonly in pairs.....11. *A. bisceptrum.*
Perianth segments acute, pinkish to white.....12. *A. sanbornii.*
Scapes ¼ to 2½ in. high; ovary crests evident to obscure; perianth segments lanceolate to oblong, obtuse to acuminate.
Stamens shorter than the perianth; Sierra Nevada.....13. *A. tribracteatum.*
Stamens equaling or exceeding the perianth; S. Cal.....14. *A. burlewii.*
Bulb-coats with distinct reticulation.
Reticulation of bulb-coats undulate-horizontal.
Leaves 2; bulbs gray; ovary without crests.....15. *A. hyalinum.*
Leaves several; bulbs deep red; ovary broadly crested.....16. *A. amplectens.*

Reticulation of bulb-coats close, strongly serrate-horizontal.
Ovary crests minute, central.
Outer perianth segments only slightly wider than the inner.
Perianth commonly pink; pedicels equal, ¼ to ½ in. long; interior.... 17. *A. serratum.*
Perianth rose-purple; pedicels unequal, ¼ to ¾ in. long; maritime.... 18. *A. dichlamydeum.*
Outer perianth segments twice as wide as the inner and slightly longer; perianth rose-purple; pedicels unequal, ¾ to 1¼ in. long..... 19. *A. peninsulare.*
Ovary crests broad, rounded; perianth segments glandular-denticulate..... 20. *A. bolanderi.*
Reticulation of bulb-coats coarse quadrate to hexagonal.
Perianth segments deep rose-color, acuminate, the margins undulate-serrulate; pedicels ½ to 1 in. long.....21. *A. acuminatum.*
Perianth segments pinkish to rose-color, acute, the margins entire; pedicels ¼ to ½ in. long.....22. *A. lacunosum.*

B. Scape much flattened and 2-edged or narrowly winged; leaves usually 2, broadly linear or falcate.

Perianth segments narrowly lanceolate, long acuminate, or becoming filiform-subulate; stamens nearly equaling segments or exserted; ovary not crested; bulb-coats without reticulation; northern Sierra Nevada.....23. *A. platycaule.*
Perianth segments ovate-lanceolate, acute to acuminate; stamens ½ to ¾ as long as, or sometimes equaling, the segments.
Ovary crests consisting of a curved ridge; bulb-coats mostly with faint reticulation; northern Sierra Nevada.
Filaments dilated at base but distinct.....24. *A. anceps.*
Filaments united by thin dilated bases into a sort of cup.....25. *A. modocense.*
Ovary with ridges of the lobes produced above into prominent crests; filaments distinct; bulb coats not reticulated; Coast Ranges.
Umbels loose (pedicels 6 to 13 lines long).....26. *A. falcifolium.*
Umbels more compact (pedicels 4 to 7 lines long).....27. *A. breweri.*

1. **A. válidum** Wats. Swamp Onion. Scape stout, 2-edged above, 3 to 6 lines in diameter, 1½ to 3 (or 3½) ft. high; bulb ½ to 1¼ in. thick and 1½ to 2 times as long, crowning a very stout rootstock; roots thick and coarse; bulb-coats white to light reddish-brown, prominently ribbed, continuous with the broad leaves, these 4 to 6 lines wide, 1 to 2 (or 3) ft. long; perianth segments 3 to 6 lines long, lanceolate-acuminate, rose-color to nearly white; stamens and style usually exserted; capsule large, subglobose, not crested.—Wet meadows, Sierra Nevada n. to Siskiyou Co., thence s. to Trinity Co.; 4000 to 9000 ft. Common. Also in Ore.

2. **A. haèmatóchiton** Wats. Scape stout, flexuous, 7 to 12 in. high; bulb elongated-ovoid, ½ to ¾ in. broad, its coats usually deep red, rarely pale pink; leaves many, abruptly narrowing or filiform above the broad sheaths; pedicels numerous, ¼ to 1 in. long; perianth segments deep rose-color (or often nearly white) with darker midnerve, broadly ovate-acute, 3 to 4 lines long; filaments ⅔ as long as the perianth segments, narrowly subulate, with adnate deltoid bases; ovary white, truncate with very short rounded or undulate dark red crests.—Dry hills and mt. slopes from San Luis Obispo Co. to San Diego Co.

3. **A. unifòlium** Kell. Scape stout, 1 to 2 ft. high, rising from a deeply seated short horizontal rootstock bearing one or a few corms, only the rootstock or base of scape rooting; reticulation of corm coats irregular to vertical undulate; leaves 4 or 3; bracts 2, large, acuminate, membranous; umbels 10 to 30-flowered, the pedicels 1 to 1½ in. long; flowers lavender-pink; segments broadly oblong-ovate, 5 to 7 lines long, ⅓ longer than the stamens and style; ovary lobes quadratish, creased or grooved down the middle.—Rich moist lands in the valleys or open hills: Coast Ranges, 20 to 400 ft., from Monterey Co. n. to Humboldt Co. Local.

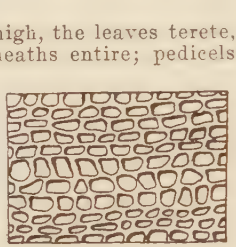
4. **A. intáctum** Jepson. Scape 12 to 20 in. high, stiff, slightly flexuous or erect; bulb-coats numerous, pinkish, the reticulation vertical, minutely rectangular; leaves 1 or 2, terete, solid, sheathing the stem 3 to 6 in., the sheath entire (not split down); bracts 3, large, ovate-acuminate with attenuate tips; umbels round, densely flowered; pedicels slender, ½ to ¾ in. long; perianth segments pink to rose-color with deeper midnerve, rather thin, lanceolate-acuminate, erose, 2 lines long; stamens equaling or exceeding the perianth; filaments opposite the inner segments with long narrow triangular bases adnate to the petal for almost half their length, the alternate filaments

243. Allium parryi Wats.; reticulations of bulb-coat x 20.

with short deltoid bases; style exserted, stigmas 3-parted; ovary with very thin walls and 6 conspicuous thin crests; crests as long as the ovary; capsule one-seeded.—Placer Co.

5. **A. párryi** Wats. Fig. 243. Scape 3 to 6 in. high; bulb coats reddish-brown, quadratish-reticulate; leaf solitary, as long as or slightly longer than the scape, the sheath entire, about ½ as long as the scape; pedicels 4 to 8 lines long; perianth segments lanceolate, acuminate, erect, 3 to 4 lines long, white to pale rose; stamens opposite the outer segments about ¾ their length; ovary crests conspicuous, emarginate to erose.—San Bernardino Mts., 6500 ft.

6. **A. fimbriàtum** Wats. Fig. 244. Scape 2 to 3 in. high, the leaves terete, narrow (½ to 1 line broad), exceeding the scape; sheaths entire; pedicels 2 to 6 lines long; bracts 2, sometimes 3 or 4; perianth dark to pale rose, its segments ovate-lanceolate, 4 to 5 (or 6) lines long, erect but the tips more or less recurving; stamens ½ as long as the segments; ovary crests 2 to each lobe, fringed a little, finely toothed or fimbriate to nearly entire.—Ranges bordering the desert from San Diego Co. n. through the Mohave Desert. Var. MOHAVÉNSE Jepson. Perianth segments ovate, bluntish or rounded, 3 lines long, commonly pale pink; ovary crests sparingly toothed or emarginate.—Calico Mts. Var. ABORÍGINUM Jepson. Umbels relatively loose, the pedicels 8 to 10 lines long; ovary crests long and thin, toothed.—S. Sierra Nevada from Fresno Co. to Tulare Co., and inner North Coast Range.



244. Allium fimbriatum Wats.; reticulations of bulb-coat x 20.

7. **A. peirsònii** Jepson. Scape stout, 3 to 4 in. high; leaf 1, terete or teretish, 1 to 2½ lines thick, 4 to 8½ in. long above the sheath (much exceeding the scape); flowers many in a compact umbel, the pedicels 3 to 4 (or 5) lines long; bracts 2; perianth reddish or light pink, 6 to 7 lines long, the segments straight; stamens about ¾ the length of the perianth segments; ovary crests prominent, slender, often as long as the ovary, toothed at apex.—Rock slides, high cañons of the San Gabriel Mts., 5350 to 9400 ft.

8. **A. átrorùbens** Wats. Three to 4 in. high; bulb-coats without distinct reticulation; pedicels 15 to 20, 6 to 7 lines long; bracts 2 or 3; leaves coiled at tip; flowers dark or lead-purple; perianth segments stiff, spreading, lanceolate, long-acuminate, 4 to 5 lines long; ovary crests 6, almost as long as the ovary.—E. side of the Sierra Nevada.

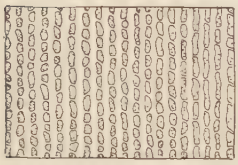
9. **A. anserìnum** Jepson. Scape terete, 5 to 6 in. high; leaf one, flat; umbel about 20-flowered; pedicels about 4 lines long; perianth purplish or pinkish, its segments oblong-ovate, 5 to 6 lines long, spreading at tip; stamens about ⅔ as long as the perianth; ovary-cells with 2 crests; crests oblongish, much lacerate or laciniate, twice as long as the ovary; stigma slightly 3-cleft.—Modoc Co.

10. **A. campánulàtum** Wats. Scape 4 to 7 or 11 in. high, erect, often flexuous; reticulation of bulb-coats none or sinuate-quadratish; leaves 2; umbel 10 to 50-flowered; pedicels 4 to 15 lines long; flowers somewhat campanulate, pink or rose-color; perianth segments broadly ovate, acute or short-acuminate, 3 to 4 lines long, nearly equal, ¼ longer than the very slender stamens and style; filament bases nearly equal; ovary prominently crested, the crests somewhat horizontal.—Usually in dry places, Sierra Nevada, s. to Tehachapi, n. to Shasta Co., thence s. to e. Humboldt Co., 3000 to 6000 ft. Var. BIDWÉLLIAE Jepson. Perianth segments ovate at base, long-acuminate above.—Sierra Nevada and inner North Coast Range, 6000 to 9000 ft.; w. Nev. to Ore.

11. **A. biscéptrum** Wats. Scapes often stout, commonly in pairs (or 3s or 4s), but frequently solitary, 5 or 10 to 14 in. high; bulb-coats light-colored with indistinct reticulation; flowers few to many, rose-colored; perianth

segments 3 to 4 lines long, unequal, oblong-lanceolate, acuminate, exceeding the stamens, the inner more narrow, their bases hidden by the broad outer ones; filaments with unequal deltoid bases, those opposite the inner perianth segments with bases expanded and adnate, the alternate ones with mainly free bases; ovary crests 2 or 3 to each lobe, very thin, conspicuous, sometimes much toothed.—E. of the Sierra Nevada crest (from Tulare Co. to Placer Co. and n. to Modoc Co.), also local on the w. slope, and very local in the high inner Coast Ranges; San Bernardino Mts. Also in Nev.

12. **A. sanbórnii** Wood. Fig. 245. Scape 10 to 14 in. high; outer bulb-coats light-colored, reticulation vertical, minutely white-dotted or undulated rectangular; pedicels 3 to 8 lines long, perianth segments white or pinkish (thin and lax in fruit), 2½ to 3 lines long, the outer broadly ovate-lanceolate, the inner narrower; stamens and style ⅔ the length of the segments ("exserted" in the type); filaments opposite inner segments with adnate bases 1½ to 2 times the height of the others; capsule thin-walled, 6-crested, the crests oblong or sometimes lanceolate, conspicuous. —Sierra Nevada from Yuba Co. to Mariposa Co., 1500 to 4000 ft.; Santa Lucia Mts. Rare. Var. CONGDÒNII Jepson. Perianth segments elliptic-acuminate, very thin, erose; outer bulb-coat with vertical reticulation, not undulated.—Mariposa Co.



245. Allium sanbornii Wood; reticulations of bulb-coat x 10.

13. **A. tribrácteàtum** Torr. Scape rising above the ground only ¼ to 2½ in., generally slender, channeled and more or less distinctly 4-angled, 2 angles often more prominent; bulb-coats white with minute more or less distinct oblong to hexagonal reticulation; bracts usually 3, short-obovate, acuminate; leaves 1 or 2, linear-lanceolate, 1½ to 5 times as high as the scape; perianth segments 2 to 4 lines long, narrowly ovate, acuminate to obtuse, silver-white to pinkish with brown or purple midnerve; filaments ⅔ to almost as long as the segments; ovary strongly and angularly 3-lobed, its crests varying from prominent to obscure or none, usually consisting of 2 rounded ridges, with a longitudinal channel between them.—Granite sand, Sierra Nevada, 8000 to 9500 ft., from Lassen Peak s. to Kern Co. Var. PÁRVUM Jepson. Perianth segments oblong, obtuse.—High Sierra Nevada (7500 to 10,500 ft.). Var. ANDERSÒNII Wats. Perianth segments oblong, obtuse, 3 to 5 lines long; bracts 2, rose-purple, broadly ovate, acuminate.—Truckee River basin.

14. **A. burléwii** Davidson. Resembling no. 13; plants 1 to 2 in. high; bracts 3 to 5, ovate, acute, with connate bases; leaf solitary, twice the height of the inflorescence; perianth segments lanceolate-attenuate, 4 to 6 lines long; stamens equal to segments or slightly exserted; style exserted 1 to 2 lines.—Mts. of S. Cal., 6700 to 9000 ft.: San Jacinto Mts.; Mt. San Antonio; Mt. Pinos.

15. **A. hyálinum** Curran. Scape 6 to 14 in. high; bulb-coats gray, with horizontal, strongly undulate to serrate reticulation; leaves generally 1 or 2, linear, channeled; bracts ovate, acuminate; pedicels 6 to 11 lines long; perianth segments lanceolate to ovate, obtuse or acute, pale pink to white, becoming thin, hyaline and spreading; filaments subulate from a narrowly deltoid base, unequal, ½ to ⅔ the length of the perianth segments; capsule not crested. — Rocky slopes, Sierra Nevada, 500 to 2600 ft., from Eldorado Co. to Kern Co. Var. PRAÈCOX Jepson. Fig. 246. Scape stouter, leaves broader; pedicels mostly ¾ to 1¼ in. long; reticulation of inner bulb-coats contorted-undulate; perianth segments acute, longer, with rose-purple midnerve.—San Bernardino to San Diego Co.; Santa Barbara Islands; n. L. Cal. Var. HICKMÁNII Jepson. Like the species but scape shorter (3 to 6 in. high); leaves 2 to several, filiform; perianth segments less hyaline, the midnerve rose-pink. —Monterey.

246. Allium hyalinum Curran var. praecox Jepson; reticulations of bulb-coat x 10.

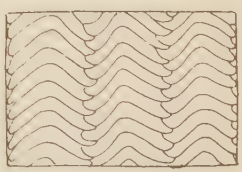
16. **A. ampléctens** Torr. Scape slender, 6 to 13 in. high; bulb-coats commonly reddish, with a delicate transversely sinuate or serrate reticulation, the vertical lines especially also minutely sinuous; leaves narrow and becoming convolute-filiform above the sheathing base; bracts 2, short, abruptly acute; umbel erect, usually dense; pedicels 25 to 35, 3 to 8 lines long; flowers white or nearly so, the oblanceolate acuminate segments 3 to 4 lines long, more or less exceeding the stamens and style; ovary crests low, broad.—Wet often rocky slopes at lower and middle altitudes (1000 to 4000 ft.): North Coast Ranges and Sierra Nevada; n. to Ore. (A. attenuifolium Kell.)

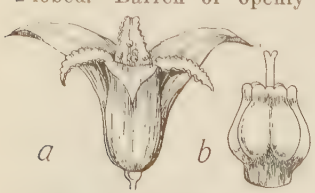
17. **A. serrátum** Wats. Fig. 247. Scape 8 to 15 in. high; bulb-coats horizontally serrate-reticulate, the reticulation close but distinct; bracts narrowly acuminate; perianth segments pink, broadly ovate-lanceolate, 4 to 6 lines long, acute or somewhat acuminate, nearly straight and rather rigid, the inner narrower, somewhat shorter and rarely serrulate; filaments all with a narrowly deltoid base; ovary lobes lightly grooved down the middle, ending above in 2 erect teeth.—Lower hills of the inner Coast Range from Solano Co. to the Mt. Hamilton Range, thence w. to the inner slope of the Santa Cruz Mts., 300 to 2000 ft. Its umbels have more numerous flowers and its perianth is thinner than in A. peninsulare. After anthesis the tips of the perianth segments are bent in abruptly and connivent at the center, the whole perianth becoming bladdery inflated.

247. Allium serratum Wats.; *a*, umbel x 1; *b*, long. sect. fl. x 2.

18. **A. dichlamýdeum** Greene. Lower than A. peninsulare but very similar; umbels very compact, the pedicels ¼ to ¾ in. long; perianth segments spreading almost equally, the outer narrowly to broadly elliptic, rounded or as if truncate but shortly acute, the inner for the most part nearly as broad. —Maritime, in a coastal belt from San Mateo Co. to Mendocino Co., extending inland only to the coast-like "island" of vegetation in ne. Contra Costa Co. Bracts 2, commonly united below into a cup; in A. peninsulare they are less united or distinct.

19. **A. peninsulâre** Lemmon. Fig. 248. Habit and bulb-coats of A. serratum, the scapes usually more stocky; pedicels ¾ to 1¼ in. long; perianth segments deep red-purple, 5 to 7 lines long, the outer 3 broadly ovate-lanceolate, somewhat spreading, twice the breadth and usually ¼ longer than the 3 inner erect attenuate segments which form a sort of inner cup; filaments ½ to ⅔ the length of the segments, those opposite the inner segments with deltoid bases longer than the bases of those alternate; ovary crests central, very minute, narrowly 2-lobed.—Barren or openly wooded hills: cismontane S. Cal.; Sierra Nevada from Kern Co. to Placer Co.; inner South Coast Range; also in n. L. Cal. Var. CRÍSPUM Jepson. Fig. 249. Margins of the inner perianth segments strongly undulate-crisped, as if irregularly serrate; filaments broader, nearly sepaloid; ovary crests almost or quite none.—Inner South Coast Ranges from the Mt. Hamilton Range and San Juan River Valley s. to San Luis Obispo Co. and the foothills bordering the upper San Joaquin Valley. The crinkly


248. Allium peninsulare Lemmon; reticulations of bulb-coat x 10.

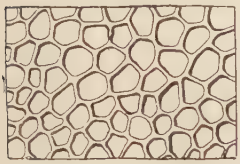


249. Allium peninsulare Lemmon var. crispum Jepson; *a*, fl. x 2; *b*, pistil x 6.

white edges of the inner segments are very striking in living flowers.

250. Allium bolanderi Wats.; reticulations of corm-coat x 10.

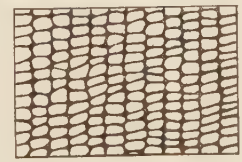
20. **A. bolánderi** Wats. Fig. 250. Scape very slender, (3 or) 6 to 10 in. high; outer corm-coats dense, the reticulation undulate-serrate; bracts 2, 7 to 8 lines long, ovate-lanceolate, acuminate; pedicels 10 to 17, slender, 5 to 10 lines long; flowers rose-color or pinkish, the ovate very narrowly acuminate segments nearly straight, 4 to 5 lines long, twice longer than the stamens and style, inner segments glandular-denticulate; filaments filiform, adnate to the middle, those opposite the inner segments slightly longer; ovary crested by the rounded summits of the lobes.—Usually in dry soil, brushy hills and open woods, from Lake Co. to Siskiyou and Modoc Cos., 800 to 2700 ft.; s. Ore. Var. STENÁNTHUM Jepson. Taller with paler (white to pink) flowers and narrower segments.—E. and ne. Humboldt Co.



251. Allium acuminatum Hook.; reticulations of bulb-coat x 5.

21. **A. acuminàtum** Hook. Fig. 251. Scape 4 to 8 in. high; outer bulb-coats with a distinct coarse quadrate to hexagonal reticulation; umbel 12 to 30-flowered; its pedicels 6 to 12 lines long; flowers deep rose-color, 4 to 7 lines long; segments broadly lanceolate with acuminate recurved tips, a third longer than the stamens, undulate-serrulate above the base; filaments with lower third adnate and dilated; ovary with 6 blunt central crests.—Dry interior hills, Humboldt, Siskiyou and Modoc Cos.; n. to B. C., e. to Col.

22. **A. lacunòsum** Wats. Fig. 252. Scape 3 to 6 in. high; bulb-coats light colored, thick and distinctly pitted by the quadrate or transversely oblong reticulation; umbels 10 to 20-flowered, the pedicels 3 to 5 lines long; bracts broadly ovate, tipped with a slender-subulate point; flowers small (3 lines long); perianth segments pinkish to rose-color with darker or red midnerve, oblong-lanceolate and acuminate, or oblong and acute, a little exceeding the stamens; filaments narrowly deltoid below; each ovary-cell with an obtuse thickened ridge toward the summit on each side, the ridges uniting to form a broad often slightly lobed crest.—Arid areas, mostly toward the interior, cent. and S. Cal. at widely scattered stations.

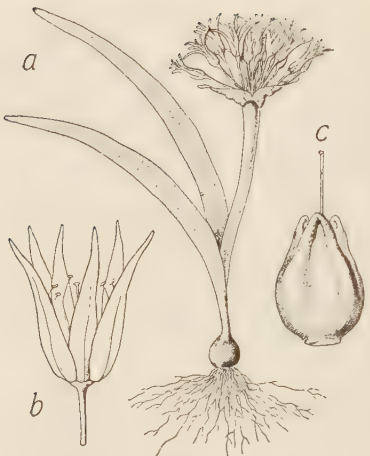


252. Allium lacunosum Wats.; reticulations of bulb-coat x 10.

23. **A. platycáule** Wats. Scape 2 to 5 (or 6) in. high, 2 to 4 lines broad; bulb ½ to 1 in. broad; leaves ½ to 1 in. broad; flowers numerous, rose-color with tips pale greenish tinged, 4 to 7 lines long, on pedicels approximately 1 in. long; segments lanceolate, very narrowly long-acuminate; stamens conspicuously exserted; ovary lobes rounded, not crested. —High valleys, Sierra Nevada from Placer Co. to Modoc Co.

24. **A. ánceps** Kell. Scape 5 to 6 in. high, 1 to 1½ lines broad; bulb-coats faintly and transversely rectangular-reticulated; leaves somewhat falcate, 1½ to 2½ lines broad; flowers numerous, pale rose-color without dark midveins, 3 to 4 lines long, on pedicels 6 to 8 lines long; segments oblong or linear-lanceolate, acuminate, only slightly or not at all exceeding the stamens; ovary cells with a thin curving ridge at summit which is truncatish or notched above.—E. of the Sierra Nevada crest from Sierra Co. n. to Ore., e. to w. Nev. Var. LEMMÒNII Jepson. Perianth segments shortly lanceolate-acuminate, 2½ to 3 lines long; ovary cells with 2 low narrow parallel or somewhat sinuous ridges; stigma undivided.—N. Sierra Nevada.

25. **A. modocénse** Jepson. Scape flattened, 1½ to 2 (or 4) in. high, prominently nerved, the 1 or 2 leaves twice as high; reticulation of the bulb-coat none or faintly and transversely quadratish; umbel 20 to 30-flowered, the



253. Allium falcifolium H. & A.; *a*, plant x ¼; *b*, flower x 1½; *c*, pistil x 3½.

pedicels 6 to 8 lines long; bracts 2; perianth segments white with broad pink midveins, oblong-lanceolate, 5 to 7 lines long; filaments ⅔ as long as the segments, adnate by the lower ¼ and united by the dilated bases into a low but distinct cup; ovary cells with 2 low thin ridges confluent above and thus forming a single curved obtuse crest.—Gravelly soil, 5000 to 7000 ft.: Modoc Co.

26. **A. falcifòlium** H. & A. Fig. 253. Scape 2 to 3 or 4 in. high, conspicuously flattened (1 to 3 lines broad) and 2-winged, at least above; bulb-coats not reticulated; leaves 3 to 5 lines broad; bracts 2, nearly or quite as long as the flowers; flowers rose-colored, the lanceolate segments acute and erect or attenuate and slightly spreading above, often very minutely glandular-serrate, 4 to 7 lines long; stamens ½ to ¾ the length of the segments; ovary 3-lobed, the lobes creased down the middle and produced above into narrow slightly toothed crests. —Shallow soil on rock rifts or ledges: North Coast Ranges from Napa Co. to Siskiyou Co., 1500 to 6500 ft.; n. to Ore. Var. DEMÍSSUM Jepson. Plants small, 1 to 2 in. high; leaves 2, greatly exceeding the scape; bracts 2; pedicels 3 to 6 lines long; flowers small, 3 lines long, deep red purple—High montane, loose rocky soil, 6000 to 8000 ft., w. Siskiyou Co.

27. **A. bréweri** Wats. Fig. 254. Very close to A. falcifolium but smaller; scape not 2-winged; leaves two, 2 to 5 lines broad; bracts 2, little exceeding the pedicels; umbel compact, the pedicels 4 to 7 lines long; perianth light rose color, its segments 5 to 6 lines long, mostly erect; stamens ⅔ as long as the segments; ovary crests consisting of a curved ridge, the apex of the crest or curved ridge short and "entire" or minutely denticulate.—Mountain summits of the Mt. Diablo, Mt. Hamilton and Santa Cruz ranges, 3500 to 4200 ft.

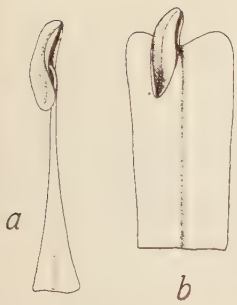
254. Allium Breweri Wats.; long. sect. fl. x 2.

14. **MUÍLLA** Wats.

Like Allium, but the herbage without the taste or odor of onions. Scape from a fibro-membranous coated corm and bearing an umbel subtended by 3 acuminate scarious bracts, which are distinct even in the bud, or slightly connate and overlapping at the base; pedicels not jointed at the summit, but subtended by small unequal membranous bractlets. Leaves very narrow, flat to terete. Flowers greenish or yellowish-white. Perianth sub-rotate, persistent, of 6 nearly equal segments; segments slightly united at base, oblong, with a dark 2-nerved mid-rib (alternate segments occasionally 3-nerved). Stamens inserted near the base. Ovules 8 to 10 in each cell; style clavate, persistent and at length splitting. Capsule globose, scarcely lobed, loculicidal. Seeds compressed and angled. (Anagram of Allium.)

Filaments filiform or subulate.
  Perianth without glands.....1. *M. maritima.*
  Inner perianth segments with pit-like glands.....2. *M. serotina.*
Filaments greatly dilated, retuse at apex.....3. *M. coronata.*

1. **M. maritima** (Torr.) Wats. Fig. 255a. Scape 3 to 9 (or 12) in. high, generally equal to or a little taller than the narrowly linear almost terete leaves; umbel 4 to 12-flowered; pedicels unequal, ¼ to 1 in. long; perianth segments 2 to 3 lines long, acute to obtuse, the inner generally wider, with broad thickened brownish midnerve and thin greenish-white margins; fila-



255. *a*, Muilla maritima Wats.; stamen x 16; *b*, M. coronata Greene, stamen x 16.

ments filiform to subulate; anthers yellow or lurid purple.—Alkaline fields, Sacramento Valley and Marin Co. to S. Cal.

2. **M. seròtina** Greene. Scape 14 to 20 in. high; leaves fewer; umbel 10 to 20 (or 40)-flowered; perianth dull white, with very broad green veins to the segments.—Half-open foothills: upper San Joaquin Valley; more common in the mts. or towards the interior of S. Cal.

3. **M. coronàta** Greene. Fig. 255b. Scape 1½ to 2 in. high; perianth segments with narrow white scarious border; filaments hyaline, broadly oblong, retuse at summit, the anther on a short inflexed slender cusp arising from the notch.—Antelope Valley, w. Mohave Desert.

15. **BLOOMÈRIA** Kell.

Stem scapose, from a fibrous-coated corm. Leaves linear, carinate. Umbel with many yellow flowers; pedicels jointed at the summit and subtended by membranous bracts. Perianth persistent, of 6 nearly equal distinct segments. Stamens 6, inserted on the base of and rather shorter than the segments; filaments filiform, margined at base by wing-like appendages. Capsule subglobose; seeds 2 to several in each cell, angular and wrinkled; style 1, persistent and splitting with the loculicidal capsule. (H. G. Bloomer, a pioneer botanist of San Francisco.)

Stamen appendages papillose; style as long or longer than the ovary.....1. *B. crocea.*
Stamen appendages smooth, fleshy; style shorter than the ovary.....2. *B. clevelandii.*

1. **B. cròcea** (Torr.) Cov. GOLDEN BLOOMERIA. Scape 6 to 14 in. high, minutely scabrous; leaves 2, 2 to 3 lines wide, one of them as long as the scape; pedicels 30 to 50, 1½ to 2 in. long; bracts several, subulate-lanceolate; perianth segments orange-yellow, linear-oblong, sub-rotate, 5 to 6 lines long, striped with 2 closely parallel dark lines; lower ⅔ or ½ of the stamen appendages adnate to the perianth, the upper free portion ending in a nectar-bearing often bicuspidate cup bearing the filament; capsule nearly 3 lines long.—South Coast Ranges, e. to the Sierra Nevada of Kern Co. and s. to coastal S. Cal. May-June.

2. **B. clevelándii** Wats. Scape stout, 3 to 12 in. high; leaves several, narrow (1 line wide or less); pedicels 20 to 30, slender, 1 to 1¼ in. long; inner flowers of the umbel maturing slowly; perianth segments yellow with a green stripe, linear-elliptic, 3 to 4 lines long; stamen appendages oblong, entire, obtuse at the summit, adnate to the perianth segments, only 1/5 their length; capsule 2 to 2½ lines long.—Mesas, San Diego.

16. **BRODIAÈA** Sm.

Stem scapose, arising from a corm, erect and straight, or sometimes elongated and twining. Leaves mostly few and grass-like. Flowers in a loose or capitate umbel. Pedicels jointed beneath the perianth. Perianth-tube various. Stamens 6, or the alternate stamens replaced by dilated sterile filaments or staminodia. Filaments slender or more frequently winged and produced beyond the anther in the form of thin appendages. Ovary on a short stipe or sessile. Capsule loculicidal, beaked by the style which splits with the valves. (James Brodie, Scotch botanist.)

A. Umbels loose; stamens 6; anthers versatile (basifixed in no. 7), ovate or ovate-lanceolate; ovary on a long or short stipe; pedicels nearly equal, rather lax; corms somewhat flattened; leaves ¼ to ½ in. wide (except no. 4).—Subgenus TRITELIA.

Filaments filiform.
Flowers commonly blue or purple, sometimes pale or nearly white; ovary on a long slender stipe.
Pedicels 1 to 1½ times the perianth.
Stamens in one row; filaments deltoid; restricted range.....1. *B. bridgesii.*
Stamens in 2 rows; filaments not deltoid; mostly adobe or clay fields and hillsides, common and widely distributed.....2. *B. laxa.*

Pedicels 3 to 6 times the perianth; low wet ground mostly near the coast.....
3. *B. pedunculariis.*

Flowers yellow; ovary equaling or longer than the stipe.
Filaments long, slender, sub-equal; leaves 1 to 2 lines wide.....4. *B. gracilis.*
Filaments short, about equaling anthers, in 2 rows; leaves ¼ to ½ in. wide...
5. *B. crocea.*

Filaments dilated.
Flowers yellow; filaments forked at apex, the anther borne on a cusp in the middle of the notch.....6. *B. ixioides.*
Flowers white; filaments with broadly triangular and slightly united bases.....
7. *B. hyacinthina.*

B. Umbels loose or mainly so; stamens 3, alternating with staminodia; anthers basifixed, sagittate; pedicels very unequal, firm; flowers blue to violet-purple or rose-color; corms not flattened; ovary short-stipitate; leaves narrowly linear to terete.—Subgenus HOOKERA.

Scapes almost wholly subterranean, the umbel sessile on the ground; staminodia yellowish.
8. *B. terrestris.*

Scapes 3 to 20 in. high; staminodia white or purple.
Perianth segments linear, rotate, nearly twice as long as the tube; throat of tube strongly constricted; staminodia purple.....9. *B. minor.*
Perianth segments oblong, 1 to 1½ times as long as the tube; throat of tube little or not at all constricted; staminodia white.
Filaments winged on each side with an appendage half as long as the anthers...
10. *B. stellaris.*

Filaments not winged.
Flowers rose-red; staminodia hugging the approximate anthers; filaments with a wing on the back.....11. *B. rosea.*
Flowers blue; anthers approximate in center around style; filaments not winged.
Staminodia erect or spreading.
Staminodia oblong-lanceolate, mostly acute; scape stout, 7 to 20 in. high.....12. *B. coronaria.*
Staminodia scale-like, triangular, acuminate; scape slender, 4 to 12 in. high.....13. *B. filifolia.*
Staminodia approximate in center.
Staminodia plane, about half as long as the spreading or recurving perianth segments.....14. *B. synandra.*
Staminodia involute, nearly as long as the erect perianth segments.
15. *B. californica.*

C. Umbels capitate or congested; anthers basifixed, nearly sessile; staminodia always present; perianth-tube more or less inflated and angular, or saccate; ovary sessile or short-stipitate; leaves linear.—Subgenus DICHELOSTEMMA.

Stamens 6; inner filaments with 2 lanceolate appendages extended beyond the anthers; bracts elliptic, acute, very conspicuous, of a deep violet-purple or metallic color; capsule sessile.....16. *B. capitata.*
Stamens commonly 3; bracts acuminate, not so conspicuous.
Flowers blue-purple; staminodia petaloid; pedicels 1 to 3 lines long; umbel capitate; capsule sessile.
Staminodia deeply parted with a minute cusp or reduced filament in the notch; umbel more or less produced into a short dense raceme.17. *B. pulchella.*
Staminodia entire, forming a corona; umbel not produced-racemose.....
18. *B. multiflora.*
Flowers rose-red; pedicels ¾ to 1½ in. long; umbel less capitate; capsule triangular-ovate, acuminate, on a short stipe.
Staminodia anther-like; perianth 6 to 8 lines long, rose-red or pinkish; flowers erect or nearly so; scape twining.....19. *B. volubilis.*
Staminodia broadly deltoid, forming a conspicuous corona; perianth 1 to 1¼ in. long; flowers pendulous.
Perianth-tube scarlet, its segments chrome-green.....20. *B. ida-maia.*
Perianth wholly rose-purple.....21. *B. venusta.*

1. **B. bridgèsii** Wats. Stems low (5 to 9 in. high); flowers pale lilac, aging bluish; perianth-tube long and very attenuate at base; filaments in 1 row, deltoid at base; ovary stipe 8½ to 10½ lines long.—Open woods, interior of Humboldt Co. to Shasta Co. and s. to Mariposa Co., 500 to 3000 ft.; also in s. Ore. Very similar to B. laxa.

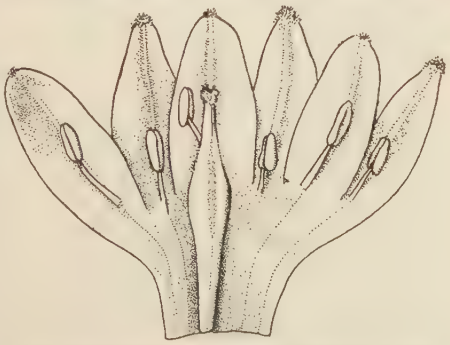
2. **B. láxa** (Benth.) Wats. GRASS NUT. Fig. 256. Scape 1 to 2¼ ft. high, rigid and stoutish, from a usually deep-seated edible corm; umbel 8 to 48-flowered; pedicels 1 or mostly 2 to 3½ in. long; perianth violet-purple, rarely white, 1¼ to 1¾ in. long, funnelform, clavate at base, its segments shorter than the tube; stamens 6, all anther-bearing; filaments inserted in 2 rows high on the perianth-tube, 2 lines long; anthers ovate-lanceolate with a 2-lobed

256. Brodiaea laxa Wats.; *a*, infl. x ⅔; *b*, long. sect. through perianth x ⅔.

base, 1½ lines long; ovary on a slender stipe ½ to ¾ in. long. — Showy and beautiful species, common in adobe fields or on adobe hillsides: Coast Ranges from Santa Cruz and Santa Clara Cos. n. to Humboldt and Tehama Cos., thence s. in the Sierra Nevada foothills (500 to 4600 ft.) to Tulare Co. Apr.-June. Very variable in stature, size of umbels and color of flowers. Called Wally-Basket in Tuolumne Co. Ithuriel's Spear is a parlor name. Var. CÁNDIDA Jepson. Pedicels abruptly bent at summit so that the flowers all face horizontally in one direction; flowers white, sometimes blue.—Sierra Nevada foothills, Fresno Co. to Kern Co. Var. NÍMIA Jepson n. var. Flowers 9 to 11 lines long, intense or deep blue; ovary very long-stiped.—Marin coast (Jepson 567, type). Var. TRÀCYI Jepson n. var. Flowers blue, 1¼ to 1½ in. long, the perianth very narrow at base (almost stipe-like).—Humboldt coast (Big Lagoon, Tracy, Jepson 9412a, type).

3. **B. pedúnculàris** (Lindl.) Wats. Scape erect, 1¼ to 3 ft. high; umbel 3 to 15-flowered, the pedicels slender, 2½ to 4 or even 7 in. long; perianth pale rose-purple or white, 6 to 9 lines long, the segments longer than the tube, widely-spreading, an indigo band on the back; ovary yellow, its stipe 1½ to 3 lines long.—Low wet ground, mostly near the coast; Marin Co. to Humboldt Co., e. to Lake Co. June-July.

4. **B. grácilis** Wats. Scape 2 to 10 in. high; leaves narrow (1 to 2 lines wide); bracts short, lanceolate; umbel 13 to 29-flowered; flowers dull or saffron yellow, 5 to 7 lines long, on pedicels 4 to 10 lines long; perianth segments with a brown streak outside, the narrow tube equaling or shorter than the segments; anthers blue, very small; filaments slender, elongated, sub-equal; ovary ovate, equaling stipe. — Granite sand spots on domes and granite ridges: Sierra Nevada, Mariposa and Tuolumne Cos. and Plumas Co., 8000 to 9000 ft.

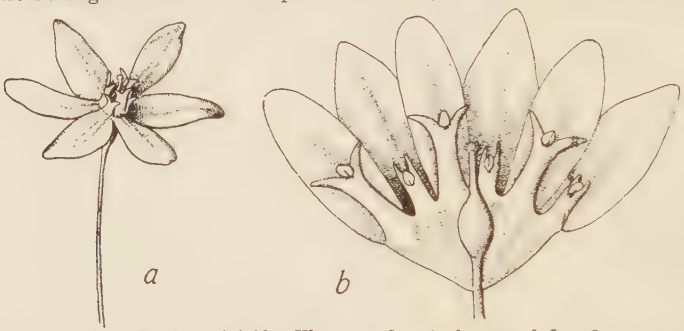


257. Brodiaea crocea Wats.; opened fl. x 2½.

5. **B. cròcea** (Wood) Wats. Fig. 257. Scape 4 to 12 in. high; leaves 2 to 6 lines broad; bracts linear, elongated; umbels 4 to 8 or 15-flowered; flowers golden or bright yellow, 7 to 9 lines long, on pedicels 3 to 9 lines long, the segments a little longer than the turbinate tube; filaments nearly

equaling anthers, in 2 rows; ovary obovate, shorter than the stipe, its angles with a very narrow band of short hairs or scales.—W. Siskyiou Co. and Del Norte Co., 5000 to 7000 ft.

6. **B. ixioides** (Ait. f.) Wats. GOLDEN BRODIAEA. Fig. 258. Scape ½ to 1½ ft. high, usually scabrous; leaves 2, 7 to 14 in. long; umbel 16 to 40-flowered; pedicels ¾ or mostly 1 to 4 in. long; flowers 6 to 9 (or 11) lines long, salmon-yellow, with a conspicuous black-purple vein on the outside running from the apex to the base of each segment: stamens yellow, alternately long and short, the filaments winged, slenderly 2-forked at the summit, the oblong anthers on a cusp in the notch; forks of the filament a little



258. Brodiaea ixioides Wats.; *a*, fl. x 1; *b*, opened fl. x 2.

exceeding or somewhat shorter than the anthers.—Higher foothills of the Sierra Nevada from Tuolumne Co. to Kern Co., 1300 to 5000 ft., common and often abundant; also in Monterey and San Benito Cos. and Tehama Co. Var. LÙGENS Jepson. Generally smaller and more slender; perianth 5 to 6 lines long, its tube dark brown, approaching black; filaments broadly winged, merely emarginate or retuse at apex, the alternate ones triangular-acuminate; anthers white or blue.—Sandy slopes, Sierra Nevada, 6000 to 8000 ft.; North Coast Ranges, towards the interior, 2400 ft.; Waterman Mt., San Gabriel Mts., 6100 ft.

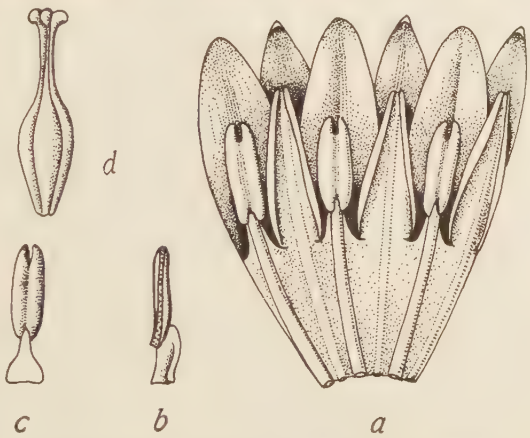
7. **B. hyacínthina** (Lindl.) Baker. WHITE BRODIAEA. Fig. 259. Scape 1 to 1¾ ft. high; umbel 10 to 40-flowered; pedicels ½ to 2 in. long; perianth open-campanulate, cleft below the middle, white or bluish white with green mid-veins, 5 to 7 lines long; filaments with broadly triangular and slightly united bases, attenuate above and tipped with an anther ½ line long; ovary short-stipitate, with 3 glandular pits toward the summit.—Common in low moist places: Sierra Nevada, Sacramento and San Joaquin valleys, and Coast Ranges from Monterey Co. to Siskiyou Co.; n. to Vancouver Isl.

259. Brodiaea hyacinthina Baker; *a*, infl. x ⅔; *b*, opened fl. x 1½.

8. **B. terréstris** Kell. Scape very short, scarcely or not at all rising above the surface of the ground; umbel 2 to 10 (or 20)-flowered, its pedicels slender, 3 to 8 in. long; perianth purple, 8 to 10 lines long, the limb rotate; anthers slightly longer than the filaments and shorter than the staminodia, these yellowish, erect, emarginate and with revolute edges.—Often in sandy soil, San Diego Co. to Humboldt Co., and near the coast, especially n.

9. **B. minor** Wats. Scape 4 to 10 in. high; umbels 4 to 10-flowered, the pedicels ¾ to 1 in. long, tending to spread horizontally after anthesis; perianth segments narrow (1 to 1½ lines broad), nearly twice as long as the tube, the throat constricted or very narrow above the ovary; staminodia purple, exceeding or equaling the stamens, 3-toothed at apex; anthers shortly cleft at apex.—N. Sierra Nevada from Butte Co. to Eldorado Co.

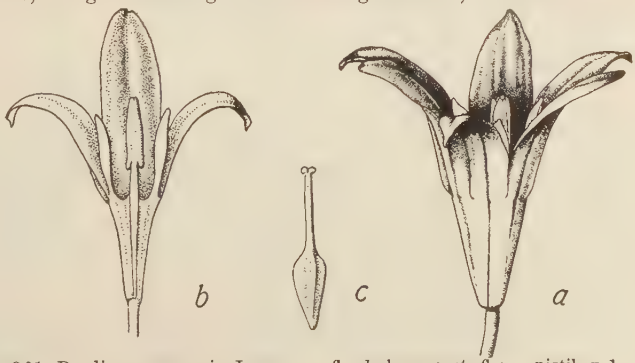
10. **B. stellàris** Wats. Scape very short (2 to 6 in. high) and pedicels long (1½ to 4 in.); corm flat, without offsets; umbel 3 to 6-flowered; perianth 6 to 9 lines long, the greenish narrow tube nearly equaling the deep-purple rather narrow segments; anthers subsessile, 1 to 1½ lines long, deeply cleft at base and apex, shorter than the staminodia, the short filaments bearing two appendages or linear-oblong wings standing directly behind and ½ to ⅔ as long as the anthers; staminodia large, conspicuously white, retuse, apparently erect and not approximate around the style.—Mendocino Range (w. of Ukiah).



260. Brodiaea rosea Baker; *a*, inside of fl.; *b*, stamen (side view); *c*, stamen (dorsal view); *d*, pistil. x 2.

11. **B. rosea** (Greene) Baker. Fig. 260. Scape slender, 3 to 5 in. high; bulb depressed ovate with heavily fibrous coat, 6 to 12 lines broad; umbel 3 to 6 (or 10)-flowered, its pedicels ½ to 1 in. long; perianth 10 lines long, flesh pink (becoming rose-pink in age or in drying), the midveins darker; perianth segments oblong-ovate, acute; filaments narrow but backed by a deltoid-dilated wing; anthers hugging the style, deeply and narrowly notched both at base and apex; staminodia long-oblong, notched at the acutish apex, exceeding the anthers and closely approximate about them by their strongly involute margins.—Ne. Lake Co. (Indian Valley), on serpentine rocks.

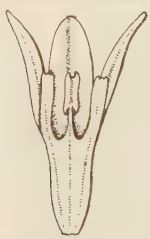
12. **B. coronària** (Salisb.) Jepson. HARVEST BRODIAEA. Fig. 261. Scape stout, (5 or) 7 to 20 in. high; umbel 3 to 11-flowered, its pedicels 1 to 3½ in. long; perianth violet-purple, 1¼ to 1¾ in. long; segments narrowly oblong, longer than the tube, in age withering and becoming caudate; anthers 4 to 5 lines long, exceeding or at least equaling the oblong-lanceolate mostly acute staminodia; staminodia erect, the anthers approximate in center around style; ovary with strongly developed angles or shoulders.—Common on rolling plains, in the



261. Brodiaea coronaria Jepson; *a*, fl.; *b*, long. sect. fl.; *c*, pistil. x 1.

foothills and mts., Coast Ranges and Sierra foothills, Sacramento and San Joaquin valleys, s. to cismontane S. Cal.; n. to Vancouver Isl., flowering in May and early June at the time of the hay harvest when the hills and fields are turning brown. Altitude 200 to 2500 ft., or up to 4500, or even 8000 ft. towards the s. Rarely occurs near the coast. Var. MÚNDULA Jepson. Fifteen to 18 in. high; pedicels 3 to 6 or 8 lines long; umbels compact.—Soulsbyville, Tuolumne Co.

13. **B. filifòlia** Wats. Scape 4 to 12 in. high, rather slender, especially when several arise from 1 corm; perianth dark blue, segments rotate; anthers sessile, nearly twice as long as the scale-like triangular narrowly acuminate staminodia.—San Bernardino Valley and foothills. Var. ORCÚTTII Jepson. Perianth violet to rose-purple; anthers generally longer than the filaments; staminodia absent, or very short, triangular and mostly adnate.—San Diego Co.



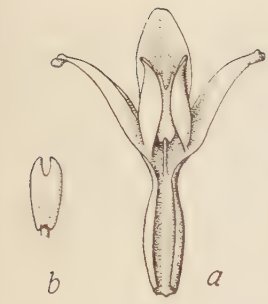
262. B. synandra Jepson; long. sect. perianth x 1.

14. **B. synándra** (Hel.) Jepson. Fig. 262. Scape slender, 3 to 8 in. high; umbel 2 to 5-flowered; its pedicels 1 to 2½ in. long; perianth blue, 7 to 12 lines long, its tube oblong or even slightly inflated, 4 to 5 lines long, the segments 1 to 2 lines longer, rotately spreading or often strongly recurved, each with a mid-vein, green on back and running down to base of perianth; anthers 2 to 2½ lines long, standing close around the style; staminodia broadly ligulate or with somewhat involute margins, commonly 3-toothed at apex, usually closely covering the anthers and thus closing the throat; ovary with weakly developed shoulders.—Dry adobe or clay soil, often on gravelly or alkaline plains and low hills, Sacramento and San Joaquin valleys, Sierra Nevada foothills and Coast Ranges, s. to cismontane S. Cal. and n. to Ore. Altitude 200 to 2500 ft., sometimes occurring up to 3500 or 7000 ft., especially s. Not reported from Humboldt and Mendocino Cos. The anthers have an open or U-shaped notch at apex; in B. coronaria the anthers are merely cleft at apex. Var. INSÍGNIS Jepson. Staminodia straw-color or whitish, ovate-lanceolate, 3½ to 4 lines long, longer than the stamens, and as long as the perianth-tube.—Shepherd Cove, Sequoia Park.

15. **B. califórnica** Lindl. Slender, 4 to 12 in. high; umbels 2 to 4-flowered (sometimes as few as 1 or as many as 12-flowered); perianth violet-purple, 1 to 1½ in. long, the tube ⅓ as long; band on back of segments yellowish-green; anthers long, approximate in center on filaments as long, and closely invested by the staminodia; staminodia white, involute, obtuse, shortly cleft, very slightly surpassing the anthers, commonly both very long, nearly as long as the perianth.—Alkaline flats: Sonoma and Napa Cos.; Sacramento Valley (Cana, Butte Co.)

16. **B. capitàta** Benth. BLUE DICKS. Fig. 263. Scape erect, ½ to 1¼ (or 2) ft. high, ending in a head-like umbel of 4 to 10 flowers, with about 4 dark purple or metallic bracts; flowers blue, 5 to 8 lines long; perianth segments elliptic-ovate, obtuse, a little longer than the tube; stamens with anthers 6; filaments opposite the inner perianth segments with a broad membranous wing extended beyond the anthers as two lanceolate appendages; stamens opposite outer perianth segments with filaments dilated toward the base only, their anthers less than ½ the size of those of the other set; appendages convergent

263. Brodiaea capitata Benth.; *a*, infl. x 1; *b*, long. sect. perianth x 2.



264. B. pulchella Greene; *a*, long. sect. perianth; *b*, anther. x 2.

or connivent, forming a corona and more or less concealing the anthers.—Very common on hillsides and plains through the Coast Ranges, Great Valley, Sierra Nevada foothills and S. Cal. Not in the higher mountains, and rare in, though not wholly absent from, the deserts. S. Ore., Ariz., L. Cal.

17. **B. pulchèlla** (Salisb.) Greene. Ookow. Fig. 264. Scape 2 to 3½ (or even 5) ft. high, often flexuous; umbel appearing capitate but really short-racemose, 6 to 16-flowered, subtended by 3 to 5 ovate subacuminate bracts; flowers lavender-purple or blue-purple, 7 to 8 lines long, in a dense head; perianth segments spreading, oblong, shorter or longer than the tube, which is slightly constricted at apex; anthers 3, sessile, the short filaments adnate to the corolla; staminodia petaloid, deeply cleft, surpassing the anthers, commonly bearing a short wholly sterile filament in the notch. —Open hills in the Coast Ranges, Alameda Co. to Humboldt Co., thence e. to Shasta Co.; n. to Wash. Common in Humboldt Co., mostly infrequent in Alameda Co. Flowers later than B. capitata.

18. **B. multiflòra** Benth. Scape 8 to 24 in. high, somewhat scabrous; umbel capitate, not produced, 8 to 24-flowered; flowers light purple; perianth-tube constricted upwards; staminodia entire, broad, obtuse, involute-cylindric, equaling or exceeding the anthers; stamens 3, rarely 6 in retarded flowers.—Sierra Nevada foothills, 500 to 3500 ft., from Mariposa Co. n. to Shasta Co., thence s. in the Coast Ranges to Humboldt Co.; Ore. June.

19. **B. volùbilis** (Kell.) Baker. Snake Lily. Twining Brodiaea. Fig. 265. Scape roughish, 2 or 3 ft. high and lax, or twining over bushes and attaining a height of 7 or 8 ft.; leaves 1 or 1½ to 2¼ ft. long, 4 to 6 lines broad, carinate; umbel short and dense, 18 to 30-flowered; pedicels ½ to 1 in. long; perianth rose-red or pinkish, 6 to 8 lines long; tube 3 to 4 lines long and broad, 6-angled, the angles produced into sacs somewhat above the middle; segments rotate, their tips recurved; stamens 3, inserted on the throat opposite the inner segments, their filaments short, with lanceolate appendages nearly or quite as long as the anthers; staminodia 3, opposite the outer segments, ligulate, emarginate. —Mostly open-brush slopes, 500 to 2500 ft.: Sierra Nevada foothills from Butte Co. to Tulare Co.; inner Coast Ranges from Napa Co. to Lake Co.

265. Brodiaea volubilis Baker; *a*, infl. x 1; *b*, flower-bud x 2; *c*, long. sect. pistil x 2.

20. **B. ida-màia** (Wood) Greene. Fire-cracker Plant. Scape slender, erect, 1 to 3 ft. high, bearing an umbel 6 to 12 (or 23)-flowered, its pedicels ¾ to 1½ in. long; flowers pendulous, erect after

anthesis; leaves linear; perianth-tube scarlet, persistent, broadly tubular, slightly 6-saccate at the truncate base, slightly constricted above, 1 to 1¼ in. long; segments chrome-green, short, erect or sometimes reflexed or revolute, erect in age, 2 to 3 lines long; stamens 3, inserted on the throat opposite the inner segments, their filaments very short and broad; anthers innate; staminodia 3, white; capsule triangular-ovate, acuminate, its stipe 2 or 3 lines long; seeds angular, black.—Wooded foothills and mountain slopes from Marin Co. to Shasta and Siskiyou Cos., 1000 to 4000 ft. July. A showy and curious species.

21. **B. venústa** (Greene) Jepson. Similar to B. ida-maia but the perianth rose-purple, constricted under the segments; staminodia pinkish, longer than the anthers.—Mendocino Range to s. Humboldt Co.

17. CALOCHÓRTUS Pursh. Mariposa Lily

Stem from a membranous-coated corm. Leaves narrow, the basal solitary or rarely 2, the cauline few. Flowers showy, white, yellow, lilac or bluish, borne terminally on the stem or branches or in an umbellate fascicle. Perianth deciduous, the segments distinct and often concave. Sepals lanceolate, greenish or colored. Petals for the most part broadly cuneate-obovate and usually bearing near the base a conspicuous gland, either on the surface or depressed in an excavation or pocket. Stamens 6, on the base of the segments. Ovary triquetrous; stigmas sessile, recurved, persistent. Capsule elliptical or oblong, membranaceous, 3-angled or winged, commonly septicidally dehiscent. Seeds numerous, in 2 rows in each cell, somewhat flattened. —The processes, or "hairs" of the glands, are in each species more or less distinctive in structure, usually markedly so, and furnish reliable differentiae. These characters were first described in the author's Flora of California. (Greek kalos, beautiful, and chortos, grass, in allusion to the flowers and grass-like leaves.)

A. Flowers open-campanulate, these and the capsules erect; sepals ovate-lanceolate; petals 1 to 2 in. long; capsule ovoid-attenuate, or oblong to linear.

1. *Gland surface densely hairy; basal leaves 1 or 2 to 4, linear, channeled, shorter than the stem (except in occasional dwarfs of nos. 3, 8 and 12).*

a. Gland not depressed, without membrane or scales.

Hairs of gland linear, entire.
- Capsule ovoid-attenuate or oblong; gland oval, surrounded or surmounted by a dark blotch.
  - Capsule oblong, obtuse, flowers cream to lilac; gland surrounded by a dark purplish maroon blotch ..... 1. *C. catalinae.*
  - Capsule ovoid, attenuate.
    - Stems sinuous, often straggling over the ground ..... 2. *C. flexuosus.*
    - Stems straight or straightish, erect.
      - Flowers lilac or purplish to white, reddish brown about the gland ..... 3. *C. palmeri.*
      - Flowers white or bluish-purple tinged, the petals yellow at base, a purple spot above the gland ..... 4. *C. leichtlinii.*
- Capsule ovoid-linear or linear; petals ornately penciled or blotched; gland shape varying, oval, transverse oblong, lunate or doubly lunate.
  - Flowers yellow, rarely white; gland transverse, lunate, broadly linear or oblong .. 5. *C. luteus.*
  - Flowers creamy white to purple, rarely yellow; petals usually oculated; gland oval, roundish or quadrate ..... 6. *C. venustus.*

Hairs of the gland with swollen and knobbed or fungoid-stellate tips; gland circular, oval or irregularly fan-shaped; sepals broadly scarious-margined; capsule linear, dense-walled.
- Gland oval with definite outline or absent, its hairs with swollen stellate tips ..... 7. *C. splendens.*
- Gland spreading with irregular outline, its hairs broadly clavate, knobbed ..... 8. *C. invenustus.*

b. Gland depressed, surrounded by a more or less continuous laciniate membrane; capsule linear, dense-walled.

Gland not circular.
- Gland oval, its membrane generally not continuous; petals dingy white to lurid purple, not persistent ..... 9. *C. nuttallii.*
- Gland obcordate, its membrane continuous; petals purple-lilac, persistent until maturity of fruit ..... 10. *C. macrocarpus.*

Gland circular, its membrane continuous.
Flowers yellow; stems tall.
Anthers reddish brown; petal hairs clavate....11. *C. clavatus.*
Anthers yellow; petal hairs slender....12. *C. concolor.*
Flowers vermilion; stem very low....13. *C. kennedyi.*

2. *Gland surface naked or with a few scattered hairs; gland circular to oblong, depressed in a pocket, bearing a dense border of linear hairs; hairs of the petals arising from a small dark spot, and of a different or darker hue than the main petal color; corm thickly covered with several coats of dark brown fibres; basal leaf one, broadly lanceolate-acuminate; cauline leaves broad, acuminate.*

Flowers orange-color to lemon-yellow; petals fringed or serrate.
Petals broadly fan-shaped, the margins fringed or serrate....14. *C. weedii.*
Petals ovate, generally black-tipped, much shorter than the sepals, the margins long-fringed....15. *C. obispoensis.*
Flowers lilac or lilac-purple; petals neither fringed nor serrate....16. *C. plummerae.*

B. Flowers closed-campanulate (or subglobose); flowers and capsules nodding; petals strongly incurved or arched, the gland deeply pocketed and transversely crested or bearded; basal leaf solitary.

Petals yellow, the margins fimbriate; gland pocket hidden by long hairs borne in 2 or 3 more or less regular rows on the upper fold of the pocket....17. *C. pulchellus.*
Petals white to pale pink or rose, the margins entire; gland lunate, pocketed, with 4 transverse imbricate scales....18. *C. albus.*

C. Flowers campanulate, erect or ascending, the capsules usually nodding; gland shallow to moderately pocketed, covered from below by a narrow fringed scale and crested above (except in C. nudus) by short hairs or scales; claw of petal below the scale often more or less glandular; basal leaf solitary, conspicuously long, surpassing the inflorescence.

Petals obovate, mostly acute, hairy all over; gland proper (excluding the more or less glandular claw of petal below the scale) from moderately curved or lunate to horseshoe-shaped, but always concave on its lower margin; anthers lanceolate-acute.
Petals yellow, or brownish, the hairs all yellow....19. *C. monophyllus.*
Petals white to purplish blue, the hairs on lower half usually blue, on upper half white....20. *C. caeruleus.*
Petals fan- or wedge-shaped, truncatish or rounded, naked, or hairy only near the gland; gland proper straight or nearly so in no. 21, in nos. 22 to 24 saucer-shaped to bowl-shaped in outline and always convex on the lower margin; anthers linear to oblong (or narrowly elliptic), acute or obtuse.
Petals white; capsules nodding.
Petals naked; anthers linear; Sierra Nevada....21. *C. nudus.*
Petals hairy about the gland; anthers short-oblong; Bay region. 22. *C. umbellatus.*
Petals lilac.
Petals finely denticulate, hairy on lower third; capsules nodding. 23. *C. uniflorus.*
Petals entire; a very few scattered hairs above the gland; capsules usually erect. 24. *C. greenei.*

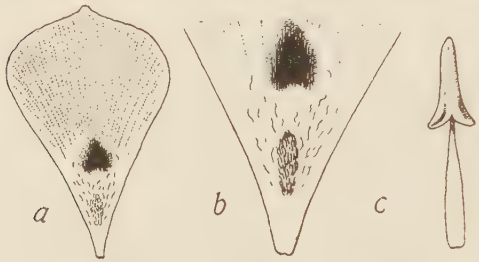
1. **C. catalinae** Wats. Stem commonly branched, 1 to 2 ft. high; sepals green, shorter than the petals; petal cuneate, longer than wide, rounded at summit, white tinged with lilac, or lilac or light purple, a large ovate purplish maroon spot at base surrounding the gland; gland oblong, covered with dark hairs; anthers obtuse, pinkish, shorter than the filaments; capsule oblong, obtuse, 1 to 2 in. long, 4 to 5 lines wide; seeds very numerous, white, thin, minutely pitted, 2 lines in diameter.—Coast of S. Cal., local from Santa Barbara Co. to Los Angeles Co., and common on the Santa Barbara Islands. Very constant in coloration.

2. **C. flexuòsus** Wats. Stem slender, remarkably sinuous, weak, commonly straggling over the ground; sepals greenish with a deep purple spot; petals with numerous striae, truncatish at apex, deep purple (rarely white), with variable bands or spots; gland and its hairs like C. palmeri.—Chuckawalla Mts.; Death Valley region; e. to Utah.

3. **C. pálmeri** Wats. Stems 4 to 12 in. high, slightly branched, not bulbiferous at base; sepals purplish-striated, oblong, acuminate, the tip recurving; petals broadly cuneate, rounded at apex, sometimes apiculate, purple, purple-striated, reddish-brown about the gland, sparsely white-hairy except on upper part; gland oval to oblong, densely tufted; hairs a little 4-sided, and narrowly winged at the angles; anthers oblong, obtuse.—Local in moist alkaline spots: borders of the Mohave Desert near the bases of the San Gabriel and

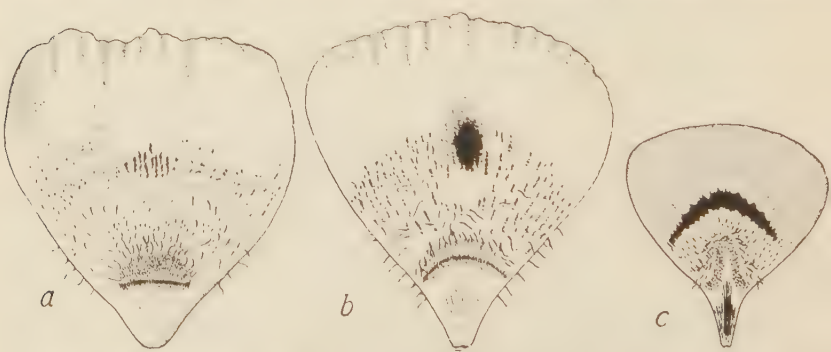
San Bernardino mountains. May. Var. PALUDÍCOLA Jepson & Ames. Sepals yellowish inside with conspicuous oblong brown spots; petals rose to pale pink.—Meadows, Bear Valley, San Bernardino Mts., 6500 ft. Var. DÚNNII Jepson & Ames. Stems 1 to 2 ft. high; sepals with white-scarious margins, sometimes with a black or reddish-brown blotch near the base; petals white with a brown transverse band crowning the gland.—Local in the interior arid mts. of San Diego Co.

4. **C. leichtlínii** Hook. Fig. 266. Stem erect, varying from 2 in. to nearly 2 ft. high, with an oblong bulblet at the base; basal leaf narrowly linear, exceeding the stem only in dwarf plants; sepals smoky blue outside, inside yellowish, scarious margined, shorter than the petals; petals obovate-cuneate, rounded at the summit, white (or less commonly purplish) with yellow base and a smoky blue or inky spot above the gland; petals ⅞ to 1¼ in. long; gland small, oval, thickly covered with yellow linear hairs and with some loose hairs immediately around the gland; anthers oblong, obtuse, slightly sagittate or after dehiscence strongly so.—Common in the Sierra Nevada from Shasta Co. s. to Tulare Co., 5000 to 7500 ft. June-July.



266. Calochortus leichtlinii Hook.; *a*, petal x 1; *b*, gland x 2; *c*, stamen x 2.

5. **C. lûteus** Dougl. YELLOW MARIPOSA. Fig. 267a. Stem erect, slender, often branching, ½ to 1 or 2 ft. high; bulblets inclosed within basal sheath of stem; basal leaves linear, 1 to 3 lines wide; sepals yellowish within; petals fan-shaped, as long as broad, ¾ to 2 in. long, yellow or orange, rarely white, with or usually without a central brown blotch but with horizontal series of vertical pencilings radiating from gland to center of petal; gland transverse, broadly linear or crescent-shaped or nearly half-moon shaped,



267. Calochortus luteus Dougl.; *a*, petal; *b*, var. oculatus Wats., petal; *c*, another petal form. x 1.

usually not reaching quite to edges of petal, densely hairy, with ascending matted yellow hairs; hairs below middle of petal few and scattering; capsule linear-oblong, 1¼ to 1¾ in. long.—Foothills and low rolling gravelly or dry land, 150 to 2500 ft.: Coast Ranges from Mendocino Co. s. to San Luis Obispo Co.; borders of the Sacramento and San Joaquin valleys; Sierra Nevada foothills. May-June. The most abundant species; extremely variable in color and markings; commonly in the hardest gravel-packed soil. Var. OCULÀTUS Wats. Fig. 267b, c. Petals white or cream with a central round or

268. C. luteus var. vestae Jepson; petal x 1.

transverse brown spot bordered with yellow.—North Coast Ranges to the Sierra foothills. Var. VÉSTAE Jepson. Fig. 268. Petals pure white above the purple brown eye-spot, heavily penciled between the eye-spot and the gland; gland very narrow, extending in a long arching curve from side to side of the petal and notched or as if interrupted at the summit of the arch (that is doubly crescent-shaped).—Blue adobe soil, interior Sonoma Co. to Humboldt Co.

6. **C. venústus** Dougl. WHITE MARIPOSA. Fig. 269. Stem erect, stiff, usually branching, 4 to 10 in. or up to 2 or 4 ft. high, 1 to 4-flowered; bulblet at base usually 1; petals broadly cuneate-obovate, 1 to 1¾ in. broad, 1 to 2½ in. long, white, varying to pale rose-color or lilac, with a red-brown eye-spot above the gland, frequently penciled toward the base, and often with a transversely oblong rose-colored blotch near the apex; gland roundish, or quadrate, densely matted with short hairs, a few scattered hairs near the gland; capsule linear, 2 to 3½ in. long.—Frequent in light sandy or alkaline soil, 150 to 2000 ft.: Coast Ranges from Mendocino Co. s. to Los Angeles

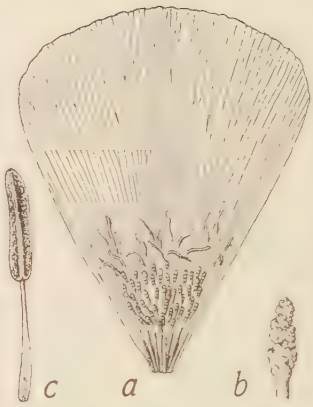
269. Calochortus venustus Dougl.; *a*, fl.; *b*, petal. x 1.

Co.; borders of the Sacramento and San Joaquin Valleys; Sierra Nevada foothills and up to 2500 or even 5000 ft. June-July. Quite constant in the shape of the gland and infinitely variable in its color markings.

7. **C. spléndens** Dougl. LILAC MARIPOSA. Fig. 270. Stem erect, 1 to 2 ft. high; sepals with a small purplish black spot at the base; petals fan-shaped, clear lilac with long scattered hairs on the lower third or fourth; petals 1⅛ to 1¾ in. long; gland small, round or oval, situated very low on the base of the petal or sometimes absent; gland surface covered with broad hairs whose expanded fungoid stellate tips form a dense mass; capsule narrowly linear, 1½ to 2 in. long.—Contra Costa and Monterey Cos. s. to San Diego Co. Common on half-open or bushy hills or mesas. May.

8. **C. ínvenústus** Greene. Fig. 271. More slender and shorter than C. splendens; stems 8 to 12 in. high, bulblet-bearing at the base; petals smaller, the scattered hairs short; gland irregular, spreading, fan-shaped; gland hairs cylindrical or subclavate with knobbed sides, not expanded stellate.—Moist

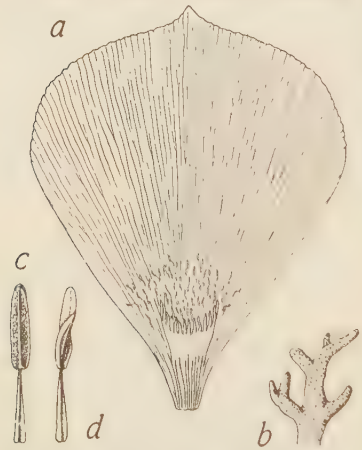
270. Calochortus splendens Dougl.; *a*, gland x 7; *b*, hair from gland x 18; *c*, stamen x 1.



271. Calochortus invenustus Greene; *a*, petal x 2; *b*, hair from gland x 12; *c*, stamen x 2.

spots, plateau valleys in the mts. w. of the Mohave and Colorado deserts, 4000 to 6500 ft.; somewhat rare. May.

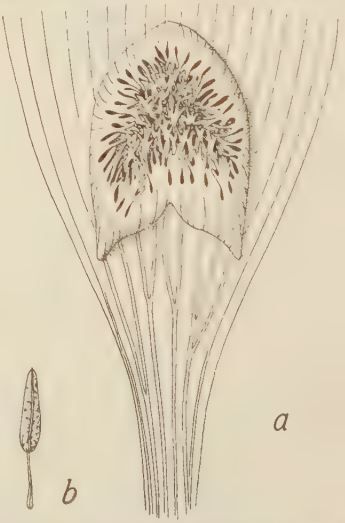
9. **C. nuttállii** Torr. SEGO LILY. Fig. 272. Stem 3 to 17 in. high, bulblet-bearing at base; basal leaf shorter than the stem or sometimes equaling it in dwarf forms; flowers solitary or in umbels; bracts with white-scarious margins; sepals shorter than the petals; petals cuneate-obovate, apiculate, slightly erose, 1 to 1¾ in. long, white, sometimes shaded with lilac or with purple, often a darker purple spot near the gland, a few long linear hairs about the gland; gland oval, rarely circular, bordered by a more or less continuous laciniated membrane and covered with hairs more or less laciniate at the tips; anthers yellow, oblong-



272. Calochortus nuttallii Torr.; *a*, petal x 2; *b*, hair from gland x 12; *c*, stamen x 2; *d*, stamen after dehiscence of anther x 2.

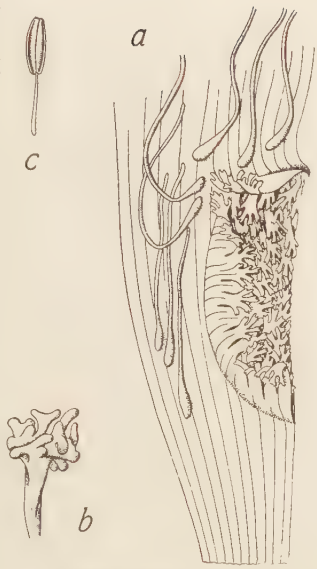
linear, obscurely sagittate at base, commonly tortuous after dehiscence, slightly longer than the filaments; capsule linear, 2 to 2½ in. long, attenuate at both ends.—Arid mts. or valleys, 4000 to 10,000 ft.; e. slope of the Sierra Nevada and s. to the high ranges bordering the deserts in S. Cal., e. to the Rocky Mts.

10. **C. macrocárpus** Dougl. Fig. 273. Stem bulbiferous at base, stout, erect, 1 to 2 ft. high; cauline leaves 3 to 5, narrow



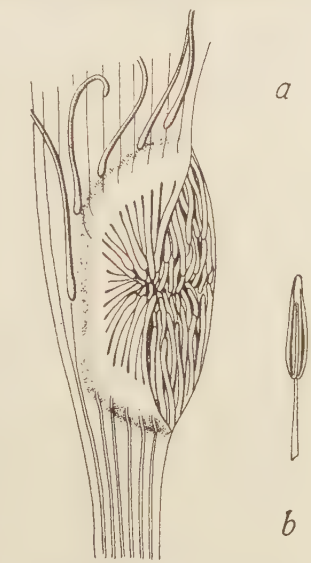
273. Calochortus macrocarpus Dougl.; *a*, gland x 5; *b*, stamen x⅔.

and convolute; sepals long-lanceolate, stiffly spreading, purple inside, equaling or slightly exceeding the petals; petals persistent until capsule has reached almost mature size, long obovate, prominently apiculate, 1½ to 2¼ in. long and ¾ in. wide, purple-lilac, lighter at base and sometimes with a deeper band below middle, a greenish median line on the back, the lower third of petal white and with scattered hairs above the gland; gland broadly A-shaped or oval with a notch on the lower side, bordered by a continuous doubly laciniate membrane and densely covered with broad hairs whose divided clavate tips form a compact mass; anthers purple or yellow, ovate-lanceolate, acutish, 4 to 7 lines long; capsule attenuate, 1½ to 2¼ in. long; seeds round, flat, 2¼ lines in diameter.—Dry sandy soil in the interior: Lassen and Modoc Cos.; n. to B. C.



274. Calochortus clavatus Wats.; *a*, gland x 7; *b*, hair from gland x 12; *c*, stamen x ⅔.

11. **C. clavàtus** Wats. Fig. 274. Stem very stout, stiff, strongly zigzag, branching, 1 to 3 ft. high; pedicels stout, 2 to 5 in. long; flowers bowl-shaped; sepals yellowish within, often purplish spotted, greenish without, with dry scarious margins, ⅔ the length of the petals; petals rich yellow, broadly fan-shaped, rather truncate, 1½ to 2 in. long, 1½ to 2¼ in. wide, strongly arched, hairy below the middle or only near the gland, often with a narrow reddish brown or lilac band above the hairy zone, the claw often reddish brown; hairs of the petals scattered, yellow, purplish red at base, the tips narrowly clavate; gland circular, shallow, bordered by an annular membrane, its inner edge deeply twice incised; gland surface thickly covered with very broad hairs with much divided or coralline tips; anthers lance-oblong to linear, obtuse, purplish brown, shorter than the slender filaments; capsule linear, attenuate above and below, 3 in. long.—Dry rocky points, usually in volcanic soils: San Benito Co. to Los Angeles, infrequent. May. Var. ÀVIUS Jepson n. var. Sepals equaling or exceeding the petals; gland in a deeper pocket.—Eldorado Co. (Pleasant Valley, Purdy, type) to Mariposa Co.



275. Calochortus concolor Purdy; *a*, gland x 7; *b*, stamen x 1.

12. **C. cóncolor** Purdy. GOLDEN-BOWL MARIPOSA. Fig. 275. Stem 2 ft. high, one to several-flowered; bulb large, reddish; pedicels stout, 1 to 3 (or 5) in. long; sepals yellowish within, purple banded, purplish-brown on the back; petals deep rich yellow tending toward orange, generally with a purplish band just above the lower third of the petal, broadly fan-shaped, 1½ to 2 in. long and as broad as long, slightly rounded at summit, the lower third or fourth thickly hairy with long erect yellow hairs; gland small, rounded oblong, covered by a deeply laciniate annular membrane, the linear divisions of the membrane converging in the center over the gland like an iris diaphragm; surface of the gland thickly covered with long

276. Calochortus kennedyi Porter; *a*, gland x 12; *b*, stamen x 1.

narrowly linear mostly entire hairs; anthers yellow, linear, slightly exceeding the filaments; capsule strongly triquetrous, lance-linear, attenuate above.—Bushy often rocky hills, cismontane S. Cal. from San Diego Co. to San Bernardino.

13. **C. kennédyi** Porter. DESERT MARIPOSA. Fig. 276. Stem rather stout, 2 to 6 (rarely 8 to 14) in. high, 2 to 4-flowered; flowers in umbels; pedicels 1 to 4 in. long; sepals ½ to ⅔ the length of the petals, vermilion or orange inside, often spotted with brown near the base, brownish without, with white-scarious margins; petals cuneate, rather truncate, ¾ to 1½ in. long, nearly as broad, flame-color, brilliant vermilion or rarely orange, naked above, a few scattered hairs below, sometimes with a black band or patch on the lower portion; gland very small, circular, bordered by a narrow black annular membrane with the inner ashy-gray edge laciniate, its surface thickly covered with short slender hairs, the hairs orange below, ashy above, once or twice dichotomously cleft; anthers brownish-purple; capsule 1½ to 2 in. long, 4 to 5 lines wide, attenuate above, the sides light-colored but often bordered at the angles with a stripe of purplish-brown.—Hard clay or gravelly soil: Mohave Desert, w. to Ventura Co., e. to southern Nev. and Ariz. Frequent. May. Var. MÚNZII Jepson n. var. Flowers pale yellow. —Providence Mts. (Bonanza King Mine, P. A. Munz 4259, type).

14. **C. wèedii** Wood. WEED'S MARIPOSA. Fig. 277. Stem 1 to 2½ ft. high, usually much branched, stout and flexuous, leafy, 1 to many-flowered, not bulbiferous; flowers 1 to 1¼ in. long; sepals shorter than or often exceeding the petals, narrowly ovate-lanceolate, yellowish within, scarious-margined; petals broadly cuneate, rounded above, sometimes apiculate, orange-color to lemon yellow, nearly covered with long silky hairs each set in a small dark spot, or the upper fourth or fifth naked; upper margins of petals fringed or serrate; gland small, circular, enclosed by a dense ring of hairs and generally bearing a few scattered hairs on its surface; anthers oblong-linear, shorter or longer than the filaments; capsule narrowly oval, attenuate above, 1½ in. long.—Dry hills, San Diego Co.; L. Cal. June. Common on the coast. Var. VÉSTUS Purdy. Petals truncatish, reddish-brown, covered with golden hairs, the upper third with brown hairs, and the margin fringed with brown hairs; anthers oblong-lanceolate.—Santa Barbara and Ventura Cos.

277. Calochortus weedii Wood; *a*, habit x ⅓; *b*, petal x 1; *c*, gland x 4; *d*, stamen x ⅔.

15. **C. obíspoénsis** Lemmon. Habit of C. weedii; sepals ⅓ to ¼ longer than the petals; petals ovate, acuminate, the tips generally black and fringed with long black hairs; gland circular to oblong, inclosed by a dense ring of very long orange hairs, the surface naked or bearing a very few scattered hairs; anthers oblong, obtuse, shorter than the filaments; capsule linear, 1 to 1½ in. long.—Cañons of the hills and mts., San Luis Obispo Co.

16. **C. plúmmerae** Greene. Habit of C. weedii; corms large, often 2, inclosed side by side in a dense fibrous coat; sepals lanceolate (white-scarious margined at

base), elongated attenuate, exceeding the petals; petals cuneate, apiculate or rounded above, lilac or lilac-purple with orange-colored hairs on lower half, the hairs usually arising from deep purple spots; gland small, circular, pocketed, inclosed by a dense ring of long orange-colored hairs gathered together above the gland, its surface naked or sometimes bearing one or few solitary hairs; capsule narrowly linear, 1¼ to 3¼ in. long.—Dry slopes and mesas: Santa Monica Mts., through the San Gabriel and San Bernardino mountains to the San Jacinto Mts. Common.

278. Calochortus pulchellus Dougl.; *a*, flowering branchlet x 1; *b*, stamen x 2.

17. **C. pulchéllus** Dougl. Golden Lantern. Fig. 278. Stem flexuous, usually dichotomously branching, ½ to 1¾ ft. high, 2 or 3 to 12-flowered; basal leaf ½ to ¾ in. wide, equal to or taller than the stem, green, glossy, sometimes tinged with purple; bracts linear-lanceolate, equaling or exceeding the flowers; flowers sub-globose, nodding; sepals greenish or brownish-yellow, ovate-lanceolate to elliptic-ovate, abruptly acute, 10 to 15 lines long, slightly shorter than the sub-orbicular petals; petals golden yellow, strongly arched or incurved, their apices overlapping and the margins bluntly incised or fringed; gland in a deeply set pocket (visible from the outside as a convex ridge), its upper fold bearing 2 or 3 rows of appressed glandular yellow hairs crossing each other over the opening of the pocket; petals with scattered hairs above the gland or rarely almost glabrous; anthers oblong, acute, 2 lines long, usually a little shorter than the filaments; capsule elliptical, abruptly short-beaked, winged, ¾ to 1¼ in. long.—Wooded hills: Mt. Diablo; North Coast Ranges from Marin and Solano Cos. to Humboldt and Tehama Cos. Apr.-May. Also called Golden Lily Bell and Fairy Lantern.

18. **C. álbus** Dougl. White Globe Lily. Fig. 279. Stem stout, glaucous, branching, 1 to 2 ft. high; basal leaf elongated lanceolate, acuminate, 1 to 2 ft. long, ⅛ to 1½ in. wide; bracts foliaceous, 3 to 5 in. long; sepals shorter than the petals, ovate, acuminate, greenish-white; petals white, purplish at base, ovate-orbicular, acutish, with scattering long silky yellow hairs above the gland, 1 to 1¼ in. long; gland lunate, shallow, with 4 transverse scales, the scales upwardly imbricate, shortly fringed; anthers oblong, mucronate; capsule 1 to 2 in. long, ½ to 1 in. broad, abruptly short-beaked; seeds brown, pitted.—Wooded slopes and cañons: Coast Ranges near the coast from the Santa Cruz Mts. s.;

279. Calochortus albus Dougl.; *a*, flowering branch x ½; *b*, petal x ¾.

San Gabriel Mts.; Cuyamaca Mts. (rare southwards); Sierra Nevada from Butte Co. to Tuolumne Co. May. Also called Snow-drops, Indian Bells, and Satin Bells. Var. RUBÉLLUS Greene. Generally lower and more slender; flowers rose-pink; gland scarcely arched, from the outside resembling a blood-blister.—S. Sierra Nevada; and the Santa Lucia Mts.; Santa Cruz Mts. June. Passes into the species.

19. **C. monophýllus** (Lindl.) Lem. YELLOW STAR TULIP. Fig. 280. Stem flexuous, branching, 3 to 8 in. high; basal leaf 9 to 12 in. high, 3 to 4 lines wide; bracts linear-lanceolate, acuminate, 2 to 4 lines wide; sepals narrowly ovate, acuminate, mucronate, about equaling petals; sepals and petals yellow or more or less purplish brown; petals obovate, 5 to 8 (or 9) lines long; gland semicircular, borne in a shallow pocket (appearing on the outside as a ridge) covered from below by a narrow laciniate scale, and densely bordered or crested above with short yellow (or the innermost white) hairs; hairs and laciniae of gland papillate; claw below the scale naked, often glandular, sometimes red-brown; capsule orbicular, 6 to 9 lines long.—Lower Yellow Pine belt of the Sierra Nevada from Shasta Co. to Tuolumne Co. Frequent. Apr.

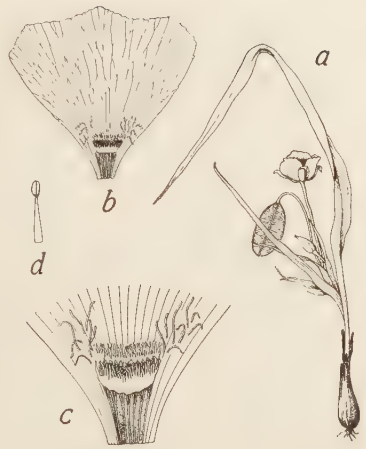
280. Calochortus monophyllus Jepson; *a*, flowering branchlet x 1; *b*, petal x 2; *c*, stamen x 4.

20. **C. caerùleus** (Kell.) Wats. BEAVERTAIL GRASS. Stems short (1 to 7 in. high), the basal leaf 1 to 3 times as long; flowers 2 to 4 (or 10) in umbels; pedicels very slender; bracts small; petals rhombic-ovate, 3½ to 6 (or 7) lines long, white or pale blue, lilac-dotted and lined with blue, hairy, the margin fringed; gland narrow, transverse, curved, shallow, covered by an appressed somewhat fringed scale and crested by a row of short scales; these latter scales narrow, often hair-like, frequently laciniate or incised; capsule orbicular or nearly so, obtuse, 6 lines long.—Open woods, middle altitudes of the Sierra Nevada from Eldorado Co. to Shasta Co., and in the high North Coast Ranges from n. Lake Co. to Siskiyou Co. June. Var. MAWEÀNUS Jepson. Pussy Ears. Sepals commonly very blue; petals purplish blue to white, 7 to 11 lines long, the margin entire or nearly so; gland horseshoe-shaped or semicircular, narrow, more or less pocketed; crest usually rather dense.—Marin Co. to Humboldt Co.

21. **C. nŭdus** Wats. SIERRA STAR TULIP. Stem 2 to 6 in. high, flexuous, bearing a single umbel of 1 to 3 (or 9) flowers; basal leaf 3 to 10 in. long, 2 to 5 lines wide, light green; sepals oblong-elliptic, shorter than the petals; petals white or pale lilac-blue, cuneate or fan-shaped, acute, denticulate above, 4 to 7 lines long, generally without hairs, in some cases a very few slender hairs above the gland or a tuft of 2 or 3 short hairs at either end of the gland; scale transversely oblong, shortly fringed, appressed; crest none; claw below the scale somewhat glandular; anthers at first pale blue, linear, acute; capsule elliptic, generally nodding.—Open coniferous woods, high Sierra Nevada from Plumas Co. to Tulare Co. Also, apparently, in the San Gabriel Mts. June-July. The smallest-flowered Calochortus. Petals often with a flash of pink or purple above the gland. Var. SHASTÉNSIS Jepson. Stem 4 to 14 in. high, slender, flexuous, more or less erect; basal leaf shorter than, equal to, or longer than the stem; petals white, pale lilac blue or deep lilac, 6 to 10 lines long; capsule elliptic, generally erect, occasionally nodding.

—Moist meadows: Sierra Nevada from Eldorado Co. n. to Mt. Shasta; thence sw. to Trinity Co.

22. **C. umbellàtus** Wood. Fig. 281. Stem 3 to 10 in. high, without bulblets, bearing 2 to 4 (or 12) flowers in 1 to 3 umbels subtended by leafy bracts, the pedicels long; herbage glaucous; sepals oblong, acuminate, greenish-white or slightly tinged with lilac; petals white or slightly lilac-tinged, cuneate or fan-shaped, slightly concave, 6 to 9 lines long; gland shallow, bowl-shaped in outline, covered from below by an appressed fringed scale and bordered by hairs on its upper side; petals otherwise naked save a hairy area (often with a purple spot below it) on each side of the gland; anthers short-oblong; capsule oblong-obtuse to orbicular, strongly nodding.—Low wooded or barren hills: region between San Ramon Valley and San Francisco Bay; Marin Co. to Mendocino Co. Mar.-Apr.



281. Calochortus umbellatus Wood; *a*, habit x ⅓; *b*, petal x 1⅓; *c*, gland x 4; *d*, stamen x 1⅓.

23. **C. uniflòrus** H. & A. Low, 4 to 10 in. high, the stem very short (commonly rising only ¼ to 1 in. out of the ground) and bearing 1 to 3 umbels with elongated flexuous pedicels (2½ to 8 in. long); bulblets 1 to 4 beneath the surface; basal leaf 4 to 6 lines broad, exceeding the inflorescence; bracts linear-lanceolate, long and conspicuous; sepals ovate-lanceolate, greenish-lilac; petals lilac, cuneate, somewhat truncate, denticulate, 10 to 14 lines long, naked above, very sparingly hairy immediately above the gland; gland shallow, convexly crescent-shaped on lower side, truncate above, covered by an appressed lightly fringed scale and with a dense border of hairs above; anthers broadly linear; capsule elliptic.—Low wet valley lands: Mendocino and Lake Cos. to Monterey Co. Apr.-May.

24. **C. grèenei** Wats. Stem scape-like, 10 to 17 in. high, bearing a 1 to 5-flowered umbel; basal leaf shorter than or equaling the stem, ½ in. broad; bracts narrow; sepals greenish, lilac within, ¾ the length of the petals; petals long fan-shaped, 1 to 1½ in. long, lilac, somewhat barred with yellow below, arched with a shallow gland pocket; pocket partly covered by a very narrow transverse fringed scale, and bordered above by a thick growth of hairs; fringe of the scale and lower hairs of the border above the gland closely papillate; lower half of petals above the gland with very sparse fine hairs 3 to 4 lines long; anthers oblong, obtuse, 2 lines long; capsule 1 in. long or somewhat shorter, orbicular to elliptic, attenuate into a stout beak, on stout flexuous or strictly erect pedicels.—Wet adobe, Siskiyou Co. to Modoc Co.

18. ERYTHRÒNIUM L. Adder's Tongue

Stem short, simple, scapose, from a deep-seated and elongated membranous-coated corm. Leaves 2, basal or nearly so. (Before coming into flower, first or second year, the plants are stemless, producing simply one broad long-petioled leaf.) Flowers large, nodding, solitary, or several and racemose; perianth segments distinct with longitudinal nectar-bearing groove and 2 or 4 sac-like or bulbous processes at base, or only the inner segments so provided. Stamens 6, hypogynous, shorter than the perianth. Style 3-cleft with 3 stigmas, or entire and stigma 1. Capsule somewhat 3-angled, loculicidal. (Greek eruthros, red, the color of the flowers in some species.)

Inner perianth segments without auricles or scales; flowers solitary or racemose..... 1. *E. purpurascens.*

Inner perianth segments with auricles and a median pair of sacs, each joined laterally to the auricle by a narrow ridge or saccate process.

Scape bearing a solitary flower or when several the pedicels often very long or unequal.
Flowers purple; pedicels often very unequal, half to as long as the scape..... 2. *E. hendersonii.*
Flowers mostly cream, yellow or pink.
Filaments filiform or very narrowly dilated.
Style and stigma entire.....3. *E. citrinum.*
Style 3-cleft or 3-lobed at apex.
Leaves bright solid green.....4. *E. grandiflorum.*
Leaves strongly mottled.....5. *E. californicum.*
Filaments ovately scarious-winged.....6. *E. revolutum.*
Scape none, the flowers 1 to 5 in an umbel sessile between the leaves, each flower thus raised on a scape-like pedicel.....7. *E. hartwegii.*

1. **E. purpuráscens** Wats. Three to 6 (or 16) in. high, the scape bearing 1 to 8 flowers in a raceme, the flowers commonly approximate, rarely with very unequal pedicels and umbellate; leaves not mottled, undulate-margined, dark metallic green; flowers light yellow tinged purple after a few days, the linear segments 7 to 8 lines long, only slightly recurved; filaments filiform; style clavate, shorter than the stamens, its stigmas obscurely lobed.—Brushy or forested slopes, 4000 to 8000 ft.: Sierra Nevada from Mt. Lassen to Tulare Co.; rare s. of Plumas Co. June-July.

2. **E. hendersònii** Wats. Seven to 12 in. high, 1-flowered or with 2 to 4 flowers on pedicels half to as long as the scape; leaves mottled, long-oblong, obtuse or obtusish, or tapering from the middle upward; perianth purple, the segments very revolute, 1¼ to 1⅝ in. long, the base of segments with a median pair of inflated or bulbous sacs, each connected with the auricles by a small sac or papilla; stigma 3-lobed.—Siskiyou Co.; sw. Ore.

3. **E. citrinum** Wats. Scape 1 to 3-flowered, 5 to 11 in. high; leaves "mottled," oblong, obtuse, or acute, more or less undulate, 3 to 6 or 10 in. long; flowers lemon-yellow, the oblong acuminate segments 1 to 1¼ in. long; inner perianth segments bearing at base a median pair of saccate protuberances, each joined laterally by a smaller sac or process to the auricle; style clavate at apex; style and stigma quite entire.—Open pine woods, cent. Sierra Nevada and sw. Ore. Apr.

4. **E. grandiflòrum** Pursh var. **parviflòrum** Wats. Scape 1 to 2 or 5-flowered; leaves bright green, without spots; flowers egg-yellow, at higher altitudes lemon-yellow; inner perianth segments auricled and with 4 equal sacs at base, the sacs ridged, wrinkled or flattened and not very distinct from each other; style 3-cleft at apex or merely 3-lobed.—High montane in n. Humboldt Co. and in Siskiyou Co.; n. to B. C.

5. **E. califórnicum** Purdy. Fawn Lily. Like preceding but leaves strongly mottled; flowers creamy white or somewhat yellowish, or white; median sacs 2, the lateral ones reduced to a transverse ridge.—Brushy or open hillslopes, 500 to 3500 ft.: n. Sonoma Co. to Humboldt and Trinity Cos. Mar.-Apr.

6. **E. revolùtum** Sm. Like E. californicum; scapes 1 or 2 (to 4)-flowered, 7 to 12 in. high; leaves lightly mottled; flowers bright pink or pale lavender, sometimes white, aging to purple; filaments broadly dilated, almost conniving around the ovary.—Woods, often on borders of swamps: Mendocino and Humboldt Cos., 10 to 20 miles from the coast, 500 to 2500 ft.; n. to B. C.

7. **E. hartwégii** Wats. Flowers solitary or borne in a 2 to 5-flowered umbel sessile between the pair of basal leaves, each flower thus appearing to be raised on a scape of its own; scape-like pedicels 3 to 6 in. high; corms forming offsets freely at the end of filiform filaments originating from their base; leaves richly mottled; flowers white or cream with orange or yellow base; inner perianth segments with a median pair of compressed sacs and with prominent auricles; stigma 3-lobed or -parted.—Brushy hillsides: Sierra Nevada foothills from Tehama Co. to Mariposa Co. Apr. Our only species which has offsets.

19. FRITILLÀRIA L.

Stem erect, simple, from a bulb of one or few thick fleshy scales. Cauline leaves alternate or whorled, narrow, sessile; basal leaves large, ovate or elliptic, borne only in the year or years before the flowering stalk appears. Flowers in racemes or solitary, dull purple, brownish, whitish or red. Peri-

anth campanulate to funnelform, deciduous, of 6 distinct segments, each segment usually with a shallow gland or nectar-bearing area above the base. Stamens 6, inserted on the base of the segments, included; filaments slender; anthers extrorse, more or less versatile. Ovary sessile or nearly so. Style 1, entire or 3-parted. Capsule membranous, 6-angled or winged, loculicidally 3-valved. Seeds numerous, in 2 rows in each cell. (Latin fritillus, a dice-box, on account of the shape of the flower.)

A. Style entire (or 3-parted at the very apex in no. 3); perianth of uniform color, its glands obscure.

Flowers yellow; plants 3 to 9 in. high.....1. *F. pudica.*
Flowers pink or pink-purple.
Perianth ¾ to 1 in. long; plants 10 to 30 in. high.....2. *F. brandegei.*
Perianth 1 to 1⅜ in. long; plants 6 to 12 in. high.....3. *F. pluriflora.*

B. Style deeply 3-cleft; perianth-glands mostly obvious.

Stem leafy only on lower half, the larger leaves mostly basal; odor often obnoxious; perianth evenly shaded, not mottled or checkered (except no. 6).
Stem 3 to 12 in. high.
Flowers dull white.....4. *F. liliacea.*
Flowers not white.
Flowers dark brownish or greenish purple.....5. *F. biflora.*
Flowers shaded with pink, checkered purple.....6. *F. purdyi.*
Stems 12 to 20 in. high; flowers yellowish green.....7. *F. agrestis.*
Stem leafy above, the lower half or third naked.
Perianth evenly shaded, not mottled or checkered, at least not commonly.
Flowers more or less purplish or greenish, often lighter within; segments obovate oblong.....8. *F. parviflora.*
Flowers green; segments lanceolate.....9. *F. viridia.*
Perianth mottled or checkered.
Flowers scarlet; style cleft ⅛ to ⅕ its length.....10. *F. recurva.*
Flowers brownish purple; style cleft to below the middle.
Leaves ovate-lanceolate; perianth segments 1 to 1½ in. long.....11. *F. lanceolata.*
Leaves linear; perianth segments ½ to ¾ in. long.
Stem slender or equably developed in proportion to the leaves; capsule acutely angled.....12. *F. atropurpurea.*
Stem stout, much thickened in proportion to the leaves; capsule with horn-like processes at the base and summit of each valve.....13. *F. pinetorum.*

1. **F. pudica** (Pursh) Spreng. YELLOW FRITILLARY. Stem 3 to 9 in. high, 1 to 3-flowered; bulb-scales very small and rounded; leaves 3 to 8, narrowly oblanceolate, alternate, borne generally on upper half of stem; perianth yellow or orange, often purple tinged outside, the segments oblong-obtuse to obovate-oblong, 5 to 9 lines long, the glands at base very small; stigma very shortly 3-lobed; capsule obovoid-oblong, ⅔ in. long.—Sierra Co. to Siskiyou Co., mostly e. and n. of the Sierra Nevada crest, 5000 to 6000 ft.; n. to B. C., e. to Utah. Apr.-May. Flowers turning brick-red and recurving in age.

2. **F. brandègei** Eastw. Stem stout, glabrous, 10 to 30 (?) in. high, about 7-flowered; leaves on upper half of stem, in 2 whorls of 5 to 9, oblong-lanceolate, 3 to 4 in. long, ½ to ¾ in. wide; flowers pinkish or purplish, campanulate with obtuse base, borne on recurved rather thick pedicels; perianth segments ¾ to 1 in. long, oblong-lanceolate, becoming involute and spreading; glands obscure; filaments subulate; style exceeding the stamens, entire, with stigma scarcely lobed; capsule winged, truncate.—In the Yellow Pine belt, Tule River basin, 5000 ft.

3. **F. pluriflòra** Torr. ADOBE LILY. Stems 6 to 12 in. high, leafy chiefly at base, 1 to 7-flowered; bulb somewhat yellowish, its scales few (6 to 8), ½ to 1 in. long; leaves 4 to 10, oblong-lanceolate; perianth uniform pink-purple, the segments obovate-oblong, acutish, 1 to 1⅜ in. long; style 3-parted at apex; capsule as broad as long, truncate at apex, narrowed toward the base, strongly 3-lobed, each lobe with 2 longitudinal dorsal ridges or wings with intervening depression.—Adobe soil in the foothills bordering the Sacramento Valley: Solano, Yolo and Butte Cos.; also in Tulare Co. Feb.-Mar. Also called Pink Fritillary.

4. **F. liliàcea** Lindl. WHITE FRITILLARY. Fig. 282. Stem 3 to 10 (or sometimes 12) in. high, often somewhat stout and succulent, 1 to 5-flowered; leaves of the basal tuft linear to oblong-lanceolate, ¼ to ¾ in. broad, 1¼ to

4½ in. long, the cauline leaves few, linear-oblong or linear; flowers dull white; perianth segments oblong-ovate to obovate, 6 to 9 lines long; gland greenish, purplish-dotted, the greenish veins sometimes glandular nearly or quite to the apex of the segments; style cleft to about the middle; capsule stipitate, truncate at each end, ½ in. long and as broad, the back of each lobe slightly channeled and 2-ridged.—Open hilltops near the coast from Drakes Bay to Monterey Co. Mar.-Apr.

232. F. liliacea Lindl.; fl. x 1.

5. **F. biflòra** Lindl. MISSION BELLS. Stem stout, 4 to 10 (rarely 12) in. high, 2 to 4 (rarely 1, less rarely as many as 7)-flowered; leaves 2 to 7, scattered or somewhat whorled below, oblong to ovate-lanceolate, 2 to 4 in. long, ¼ to 1¼ in. wide; perianth campanulate, 8 to 12 lines long, dark brownish or greenish-purple; segments oblong-lanceolate, with a longitudinal greenish glandular band extending from the base nearly to the apex; style cleft to about the middle; capsule nearly 1 in. broad, and not quite as high.—S. Cal. (cismontane region), n. to San Luis Obispo Co.; apparently localized also in the North Coast Ranges. Also called Chocolate Lily and Black Lily. Var. INFLÉXA Jepson. Longitudinal band much thickened at apex, especially on the inner perianth segments and inflexed in such a way as to form a channel at apex on the back of the segments.—Palisades region, Calistoga. Var. INEZIÀNA Jepson. Stem slender, 1 or 2-flowered; leaves linear-oblong to lanceolate, 2 to 3 in. long, 2 to 4 lines wide; perianth segments widely spreading, often faintly mottled with yellow; odor very disagreeable.—San Mateo Co. Intermediate between the species and F. purdyi. Also allied to F. liliacea.

6. **F. púrdyi** Eastw. Stem 4 to 9 in. high, 1 to 7-flowered; basal leaves ovate to oblong, obtusish, 1¼ to 2¼ in. long, the upper linear; flowers white and purple mottled, shaded with pink; style cleft about to the middle.—Humboldt and Trinity Cos.

7. **F. agréstis** Greene. STINK BELLS. Stem from very deep-seated bulb, 12 to 20 in. high, leafy on the lower half; leaves 8 to 12, oblong-oblanceolate to linear-lanceolate, alternate or the lower somewhat whorled; raceme 3 to 8-flowered, the flowers dull or yellowish-green, exactly campanulate, nodding on pedicels abruptly recurved at summit; perianth segments 1 to 1¼ in. long, 4 to 5 lines wide, yellowish green, with prominent or ligulate green band running nearly to the apex, distinctly glandular at base, and more or less glandular above; style cleft to about the middle.—Grain fields, region of the lower San Joaquin and Sacramento rivers. Odor very obnoxious.

8. **F. parviflòra** Torr. BROWN BELLS. Stem 1¼ to 2½ ft. high; bulb with numerous rice-grain bulblets; leaves linear to linear-lanceolate, 2½ to 4 in. long, 3 to 4 lines wide, borne on the upper half of the stem, the lower ones 3 to 5 in a whorl, the upper whorled or alternate; raceme long, with 4 to 10 campanulate flowers on short recurved pedicels; perianth 4 to 6 lines long, purplish or greenish white, rarely faintly mottled; segments obovate-oblong, obtuse to acuminate, with oblong-lanceolate glands on lower third; style cleft ⅓ to ⅔ its length; ovary and capsule broadly winged.—Pine woods: Sierra Nevada from Yuba Co. to Tulare Co., 1500 to 3900 ft.; occasional in the inner Coast Range.

9. **F. virídia** Kell. Stem 8 to 20 in. high, 3 to 6-flowered; bulb ¼ to ½ in. in diameter, its scales round and thick; leaves lance-linear, subacute, 1½ to 2½ in. long in 1 or 2 whorls on the upper half of the stem; flowers pendent on short pedicels, pale green to almost black, campanulate, 5 to 7 lines long; perianth segments lanceolate, somewhat chartaceous; gland dark green, lanceolate, extending from the base and continued less distinctly to the apex, or quite obscure; apical tuft of hairs short, dense, white, glandular; anthers minutely but distinctly mucronate; style 3-cleft to about the middle; ovary cylindrical, acutely angled; capsule not seen.—San Carlos Range.

10. **F. recúrva** Benth. SCARLET FRITILLARY. Stem stout, 18 to 30 in. high; bulb large and flattish, its scales numerous and thick, with rice-grain bulblets at base; leaves in 2 or 3 whorls near the middle of the stem, linear to

linear-lanceolate, 2 to 6 lines broad; flowers 3 or 4 (to 6); perianth campanulate-funnelform, 1 to 1½ in. long, scarlet-checked upon yellow, the scarlet becoming crimson and purple in old flowers, the segments recurving strongly at the tips; gland oblong, 3 lines long, slightly depressed; style slender, 3-cleft, ⅛ to ⅕ its length.—N. Sierra Nevada (Placer Co. n. to Modoc Co.); Coast Ranges (Mendocino Co. to Siskiyou Co.); n. to Ore. Var. COCCÍNEA Greene. Stems commonly more slender, 10 to 20 (or 30) in. high, 1 to 3 (or 5)-flowered; bulb small, higher than thick, its scales 2 to several; flowers scarlet, mottled with yellow; segments with tips generally not recurved.—Hoods Peak and Napa ranges n. to e. Mendocino Co.

11. **F. lanceolàta** Pursh. CHECKER LILY. Fig. 283. Stem 1½ to 2 (or 3) ft. high; scales few or none, the lower portion of the solid bulb covered with numerous rice-grain bulblets; leaves 6 to 10 in 2 or 3 whorls on the upper part of the stem, ovate-lanceolate, 2 to 4 in. long; raceme 1 to 4, sometimes to 13-flowered; perianth deeply bowl-shaped, 1 to 1½ in. long, dark purple mottled with greenish yellow, the segments ovate to oblong, deeply concave, with a very large ovate-lanceolate gland in the middle of the concavity; gland deep green, sharply defined, often with minute black dots; style cleft to below the middle; capsule broadly winged, ⅔ in. long.—Near the coast, on oak-covered or brushy hills: San Mateo Co. to Humboldt Co.; n. to B. C. and Ida. Also called Rice-root Lily. Var. FLORIBÚNDA Benth. Raceme 2 or 3 to several-flowered; perianth campanulate, purple or greenish, conspicuously spotted or checkered, 6 to 13 lines long; segments broadly oblong or narrowly ovate, crisped or erosulate-margined, the outer often broader; gland greenish, extending from the base ½ or ⅔ the way to the apex. — Shady woods, Coast Ranges from Santa Clara Co. to Lake Co. Var. GRÁCILIS Wats. Flowers smaller than the last, with narrow and more acuminate segments; stamens short and anthers often small.—Marin Co. to Napa Co. Var. TRÍSTULIS A. L. Grant. Perianth scarcely mottled, gland black-purple, not dotted.—Near the coast in Marin Co.

283. Fritillaria lanceolata Pursh; *a*, raceme x 1; *b*, perianth segment x 1½.

12. **F. àtropurpùrea** Nutt. Stem ½ to 1½ ft. high from a thick-scaled bulb; leaves 7 to 14, on the upper half of the stem, alternate or more or less whorled, narrowly linear, sessile, 2 to 4¼ in. long; flowers open-campanulate, 1 to 4 (rarely 5 or 6) on recurved pedicels; segments purplish-brown, mottled with yellowish-green, narrowly rhombic or oblong and tapering to base and apex, ½ to ¾ in. long; style cleft ¾ its length; capsule acutely angled.—High montane, 6000 to 10,500 ft.: North Coast Ranges; Sierra Nevada; San Bernardino Mts.; n. to Ore. and Mont.

13. **F. pinetòrum** Davidson. Stem stout or even somewhat fistulous, 5 to 14 in. high; bulb with numerous rice-grain bulblets; leaves 12 to 20, approximate in somewhat indefinite whorls, linear, noticeably narrow in contrast to the stoutness of the stem; flowers 3 to 8, on upright pedicels slightly flexuous

at first but becoming stout and stiff; segments dark greenish purple and yellow, mottled, broadly ovate-acuminate, obtuse at very apex, about ½ in. long; gland indefinite; filaments narrowly subulate; style 3-cleft half its length or more; capsule acutely angled with short horn-like processes at the base and summit of each valve.—Pine forests, 6000 to 9000 ft.: White Mts. and s. Sierra Nevada, s. to the San Gabriel Mts. and San Bernardino Mts.

20. LÍLIUM L. LILY

Stems simple, tall and leafy, from a scaly bulb or scaly rootstock. Leaves narrow, sessile. Flowers large and showy, solitary or 2 to many in a terminal raceme. Perianth most commonly funnelform; its segments 6, yellow, red or white, often dotted or spotted with brown, distinct, equal, spreading or recurved, with a nectar-bearing groove toward the base. Stamens 6, hypogynous, included; anthers versatile. Style one, long, deciduous; stigma 3-lobed. Capsule loculicidal; seeds numerous, flat, horizontal, in 2 rows in each cell. (Greek lilion, the classical name.) Lilies inhabiting dry slopes do not have jointed scales, while jointed scales characterize the wet land species.

A. Plants of dry places with true bulbs (not rhizomatous); bulb-scales not jointed.

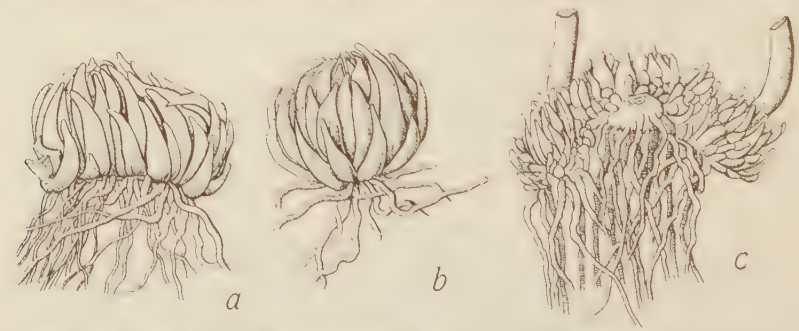
Flowers white (aging purplish or rose-purple) or pink.
- Perianth pure white or minutely purple-dotted, aging purplish, 3 to 4 in. long, its segments slightly recurved at tip.....1. *L. washingtonianum.*
- Perianth nearly white, brown-dotted, aging rose-purple, 1½ to 2 in. long, its segments recurving from the middle.....2. *L. rubescens.*
- Perianth pink, its segments revolute to the stem.....3. *L. kelloggii.*

Flowers not white.
- Perianth dark brownish-red to dingy purple.....4. *L. bolanderi.*
- Perianth orange or yellow.
  - Leaves undulate; perianth segments 2½ to 4 in. long, recurved ¾ their length..5. *L. humboldtii.*
  - Leaves plane; perianth segments 1¼ to 2 in. long, recurved ⅔ their length....6. *L. columbianum.*

B. Plants of bogs or wet places; bulb rhizomatous, its scales jointed.

Flowers red or orange.
- Flowers dark red, purple-spotted within, tips of segments recurved; rhizome not branching.....7. *L. maritimum.*
- Flowers orange-red or orange-yellow, dotted or spotted with dark purple.
  - Rhizome not branching.
    - Upper ⅔ of perianth segments at length recurving to the pedicel; scales 1 or 2-jointed.....8. *L. occidentale.*
    - Perianth segments recurving only at tip; scales 3 or 4-jointed.9. *L. parvum.*
  - Rhizome commonly branching, its scales commonly 2-jointed; perianth segments fully revolute.....10. *L. pardalinum.*

Flowers clear lemon-yellow; rhizome not branching; its scales 3 or 4-jointed..11. *L. parryi.*



284. Lilium bulbs. *a*, L. washingtonianum Kell.; *b*, L. humboldtii Roezl & Leichtl.; *c*, L. pardalinum Kell. x ⅓.

1. **L. wáshingtònianum** Kell. WASHINGTON LILY. Fig. 284a. Stem 4 to 6 ft. tall, the bulb ovate, scales not jointed; flowers pure white, often minutely purple-dotted, aging purplish; perianth tubular-campanulate, 3 to 4 in. long, the segments spreading above, not closely approximate in a tube; stamens a little shorter; anthers yellow, 5 to 6 lines long; capsule obovate-oblong, trun-

cate, obtusely 6-angled or sometimes narrowly winged.—Cent. and n. Sierra Nevada, 3000 to 6000 ft., in the upper pine forests or in thickets, n. to Mt. Shasta, thence w. to ne. Humboldt Co.; Ore. Aug. Flowers delightfully fragrant with the odor of pinks.

2. **L. rubéscens** Wats. CHAPARRAL LILY. Stem 2 to 5 ft. high; bulbs ovoid, rhizomatous, the scales not jointed; leaves broadly oblanceolate or obovate, mostly acute, 5 to 10 in a whorl, or the lower scattered; flowers several, nearly white, somewhat dotted with brown, aging to rose-purple; segments 1½ to 2 in. long, the upper ⅓ revolute; capsule obovoid with subtruncate apex and abruptly short-attenuate base, wing-angled, 1¾ in. long.—Chaparral slopes in the Coast Ranges, Santa Cruz Co. to Siskiyou Co. Near the coast called Redwood Lily; towards the interior Chaparral or Chamise Lily.

3. **L. kellóggii** Purdy. Bulb like that of L. rubescens; flowers 1 to 15; perianth segments revolute to the stem, pink, dotted purplish-black or maroon, changing to deeper rosy purple, sometimes with a central line of yellow.—Inner margin of the Redwood belt, n. Mendocino Co. to Del Norte Co. Late June, July.

4. **L. bolánderi** Wats. Stem ½ to 2½ ft. high, 1 to 7-flowered; bulb ovate, of numerous lanceolate scales 1 to 1½ in. long; leaves in 3 (or rarely 4) whorls with 1 to 3 smaller alternate leaves below, oblanceolate to obovate, acute to obtusish, 1 to 2½ in. long, ¼ to 1⅛ in. wide, glaucous beneath; flowers horizontal or somewhat nodding, dark brownish-red to lurid purple, becoming somewhat paler, spotted; segments 1¼ to 1¾ in. long, barely recurving.—Dry chaparral hillsides, inside the Redwood belt, Del Norte Co. to Siskiyou Co.; s. Ore. July.

5. **L. humbòldtii** Roezl & Leichtl. HUMBOLDT'S LILY. Fig. 284b. Stem 3 to 5 ft. high, very stout, its leaves generally purplish and slightly undulate, in 4 to 6 whorls; bulb large, ovoid, more or less oblique, its scales not jointed; flowers large, 2½ to 4 in. long, orange-red, spotted with small maroon or purple spots, the segments strongly recurving.—Open woods in lower Yellow Pine and upper Chaparral belts of the Sierra Nevada and cismontane S. Cal., 3000 to 6000 ft. Bulb-scales possessing a remarkably bitter principle. Var. BLÓOMERIÀNUM Jepson. Bulb scales several-jointed; claws of inner perianth segments somewhat crested.—Cuyamaca Mts. Var. OCELLÀTUM Kell. Bulb more globular, its scales several-jointed; leaves brighter green; purple spots of flower margined with red.—Mts. from Santa Barbara to Los Angeles; Santa Rosa Isl.

6. **L. colúmbiànum** Hanson. OREGON LILY. Stem slender, 2 to 4 ft. high; bulb small (1½ to 2 in. in diameter); upper leaves scattered, the lower in whorls; perianth segments 1½ to 2 in. long, strongly recurved, bright reddish orange, thickly spotted with purple.—Humboldt Co.; n. to Ore. and B. C.

7. **L. marítimum** Kell. COAST LILY. Stem 1 to 4 ft. high with alternate or rarely whorled leaves; bulb rhizomatous, its scales seldom more than one-jointed; leaves very dark green, narrowly oblanceolate or linear, 1 to 5 in. long and 2 to 7 lines wide; flowers 1 to 5, dark red, funnelform, horizontal on long pedicels; segments barely dotted at base, 1¼ to 1½ in. long, the upper ⅓ somewhat recurved; stamens less than 1 in. long, exceeding the style; capsule subglobose to elliptic-oblong, 9 to 10 lines long.—Low meadows or bogs near the coast, Marin Co. to Ten Mile River, Mendocino Co.

8. **L. occidentàle** Purdy. EUREKA LILY. Stem 2 ft. high in open ground or 4 to 6 ft. high in thickets; bulb like that of L. maritimum; leaves whorled on the middle of the stem, scattered below, lanceolate, acute; flowers from a few to 15, on strongly divaricate pedicels 3 to 9 in. long, nodding at summit; segments 1¼ to 2½ in. long, recurved for ⅔ their length, varying from dark red to reddish yellow, fading purplish, the lower part commonly orange with purple-black spots; anthers oblong, 2 lines long, dark red.—Near the ocean, n. Humboldt Co. to s. Ore.

9. **L. párvum** Kell. SMALL TIGER LILY. Stem 1½ to 7 ft. high; rootstock thick and fleshy, not branching, the scales 3 or 4-jointed; leaves lanceolate, 3 to 5 in. long, in whorls or quite scattered; flowers 1 or 2 to very many, small (1 to 1¼ in. long), on erect or ascending pedicels; perianth funnelform,

only the tips of the segments spreading, orange-yellow spotted with purple.—Wet places along streams or edges of swamps, Sierra Nevada n. to Mt. Shasta, 6000 to 9000 ft.; s. Ore.

10. **L. pardalìnum** Kell. TIGER LILY. Fig. 284c. Stem 3 to 5 or even 7 ft. high; rootstock thick and fleshy, densely covered with 2-jointed closely overlapping scales, branching and eventually forming large mat-like clusters; leaves in whorls or alternate, linear-lanceolate; flowers 1 to many, racemose or the lower in whorls, on long spreading pedicels; segments 2 to 3 in. long, 6 to 9 lines wide, strongly revolute, bright orange-red with a lighter orange center and large purple spots on the lower half; capsule narrowly oblong, acutely angled, 1½ in. long.—Stream banks and moist hillside meadows: Coast Ranges, at low altitudes near the sea or in the high mts.; Sierra Nevada, 3000 to 4000 ft. Also called Leopard Lily. Bulb-scales sometimes 3-jointed in some forms of it. June-Aug.

11. **L. párryi** Wats. LEMON LILY. Stem slender, glabrous, 2 to 5 ft. high, 2 to 10-flowered; bulb like that of L. parvum, its scales numerous, thick, about 1 in. long; leaves usually scattered, sometimes the lower in a whorl, linear-oblanceolate, 4 to 6 in. long, about 1 in. wide, mostly acuminate; flowers clear lemon yellow, sparingly and minutely purple-black dotted, on stout short pedicels; perianth segments 3 to 4 in. long, somewhat spreading above, or the tips recurved; stamens and style a little shorter; anthers oblong, brownish, 3 lines long; capsule narrowly oblong, acutish, nearly 2 in. long, 6 lines wide.—Moist situations, high mts.: San Diego Co. to San Bernardino and San Antonio mountains; e. to Ariz.

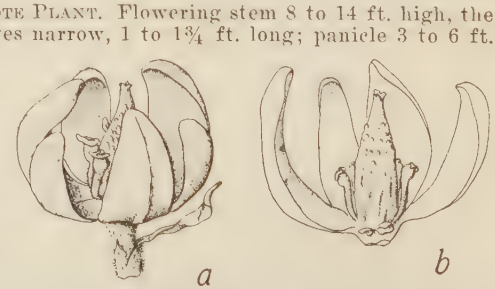
21. YÚCCA L. SPANISH BAYONET

Trees or shrubs with simple or branched stems. Leaves alternate, linear-lanceolate. Flowers large, in terminal panicles, the perianth segments distinct, nearly equal, withering-persistent. Stamens 6. Fruit a capsule, either dry and dehiscent, or somewhat fleshy and indehiscent. Seeds numerous, in 2 rows in each cell, flat, horizontal, with thin black coat.—The flowers are incapable of self-pollination, each Yucca species being dependent upon a particular moth or species of Pronuba. The female Pronuba works by night, collecting the pollen from the anthers and rolling it into a little ball; she then flies to the flower of another plant, deposits her eggs in the ovary, and then in a manner which corresponds to actions full of purpose and deliberation climbs to the style and thrusts the pollen ball down the stigmatic tube. The larva destroys about a dozen seeds, but even if several larva develop many perfect seeds are left. (An Indian name for the Manihot.)

Plants without evident trunk, the rosette of leaves on the ground; filaments glabrous; style slender with capitate stigma.....1. *Y. whipplei.*
Plants commonly with distinct trunk; filaments papillate; style short or none; stigmas 3, or 1 and 3-lobed.
Trunk tall, at summit branching freely; leaf-margin denticulate.....2. *Y. brevifolia.*
Trunk commonly short and simple or shortly branched; leaf-margin not serrate, fibrous-shredding.
Style ½ to 1½ lines long.....3. *Y. mohavensis.*
Style 6 to 10 lines long.....4. *Y. baccata.*

1. **Y. whípplei** Torr. QUIXOTE PLANT. Flowering stem 8 to 14 ft. high, the leaves in a basal rosette; leaves narrow, 1 to 1¾ ft. long; panicle 3 to 6 ft. long; flowers creamy-white, 1¼ to 1½ in. long, the perianth segments thinnish; filaments much thickened; capsule short-cylindric or subglobose, 1¼ to 2 in. long.—Chaparral belt of cismontane S. Cal.; n. in the Coast Ranges to San Benito Co. and the Sierra Nevada to Kings River. L. Cal. May-June.

2. **Y. brevifòlia** Engelm. JOSHUA TREE. Fig. 285. Tree



285. Yucca brevifolia Engelm.; *a*, fl.; *b*, long. sect. fl. x ⅔.

commonly 16 to 30 ft. high with an open crown of arm-like branches, the columnar trunk 8 to 15 ft. high and 1 to 3½ ft. in diameter; bark dark brown, checked into small squarish plates; leaves 6 to 9 in. long, the margin denticulate, not shreddy; flowers greenish white, congested in a heavy panicle 8 to 14 in. long; perianth segments very thick and fleshy, 1½ to 2 in. long; stamens ½ length of the pistil, the filaments subglobose-dilated at the recurved apex; stigmas 3, obscurely 2-lobed; capsule oblong-ovate, slightly 3-angled, 2 to 4 in. long and 1½ to 2 in. broad; seeds with ruminated endosperm.—Mesas, Mohave Desert, widely distributed and forming extensive groves, n. to eastern Kern Co. and Inyo Co.; e. to Utah.

3. **Y. mohavénsis** Sarg. Spanish Dagger. Trunk simple or shortly branched, 3 to 7 or 15 ft. high, or sometimes very short or almost none; leaves concave, light yellow-green, entire on the margin, 1¼ to 3 ft. long; flowers in a panicle 1 to 1½ ft. long; filaments narrowly dilated below (especially those opposite the inner segments), somewhat clavate at apex, nearly as long as the pistil; style very short; stigma 3-lobed, each lobe notched at apex; capsule cylindric, fleshy, 2½ to 4 in. long and 1 to 1½ in. thick, usually constricted about the middle; endosperm not ruminated.—Mohave Desert, s. through the San Jacinto and Santa Rosa mountains to n. L. Cal., extending w. to the San Bernardino Valley and the coast near San Diego; e. to Ariz. and Nev.

4. **Y. baccàta** Torr. Spanish Bayonet. Very similar to Y. mohavensis; leaf rosettes yellow-green, on the ground, rarely rising above it; leaves 1¼ to 2 ft. long; flowering stem 2 to 3¼ ft. high; flowers (2½ or) 3 to 4 in. long; base of filaments forming fleshy papillae; style much elongated; fruit conical.—E. Mohave Desert; e. to Col. and N. Mex.

22. **NOLÌNA** Michx.

Perennials with linear rigid leaves crowded in a rosette at the ground. Flowering stem stout, naked. Flowers polygamo-dioecious, much congested in a compound panicle; pedicels jointed near the base. Perianth whitish, persistent, its segments 6, distinct, elliptic to lanceolate. Stamens 6; filaments very short. Ovary deeply 3-lobed; ovules 2 in each cell, basal; style very short; stigmas 3, short, recurved. Capsule broadly 3-winged, membranous, tardily dehiscent, loculicidal or bursting irregularly; seeds often solitary. (P. C. Nolin, French agricultural essayist, middle of the 18th cent.)

Mature leaves serrulate; style present.....1. *N. parryi.*
Mature leaves not serrulate; style none.....2. *N. bigelovii.*

1. **N. párryi** Wats. Stem 3 to 6 ft. high; leaves rather thick, concave, keeled, serrulate, ¾ to 1¼ in. wide, 2 to 3½ ft. long; bracts irregularly and remotely salient-laciniate; flowers 3 lines long; capsule orbicular in outline, notched at both ends, 6 to 7 lines broad.—Arid mt. slopes, 4000 to 6000 ft.: e. San Bernardino Mts., s. through the San Jacinto Mts. to San Diego Co.; Ariz.; L. Cal. May-June.

2. **N. bigelòvii** (Torr.) Wats. Leaves scarcely concave or keeled, the margin shredding away in brown fibres; margins of bracts deeply and rather closely fringed; perianth 1 to 1½ lines long.—Mts., s. borders of the Colorado Desert; s. to L. Cal., e. to Ariz.

23. **ASPÁRAGUS** L.

Stem from a rootstock, very much branched and with filiform branchlets clustered in the axils of the scaly leaves. Flowers small, solitary or in umbels or racemes. Perianth segments alike, distinct or slightly united, the stamens inserted on their bases. Ovary 3-celled, with 2 ovules in each cell; style short, stigmas 3, recurved. Fruit a globose berry. (Ancient Greek name.)

1. **A. officinàlis** L. Asparagus. Stems tall and branching, 3 to 5 ft. high, when young stout, succulent and edible; clustered branchlets 4 to 8 lines long; flowers green, pendulous on jointed peduncles; perianth campanulate, 3 lines long, with included stamens; berry red, 4 lines in diameter.—Garden plant (nat. of Eur.) escaped to low lands about Alameda, San Bernardino and Los Angeles.

24. **STRÉPTOPUS** Michx. Twisted-stalk

Stems branching from a creeping rootstock. Leaves alternate, ovate, sessile or clasping, taper-pointed, membranous. Flowers greenish-white, axillary, solitary or in pairs, drooping on slender filiform peduncles which are bent or contorted at the middle. Perianth campanulate, the lanceolate segments distinct, recurved-spreading, deciduous. Stamens 6; filaments short, flattened. Style 1; stigma slightly 3-lobed. Fruit a red ovoid or oval berry. (Greek streptos, twisted, and pous, foot or stalk.)

1. **S. ampléxifòlius** (L.) DC. Liver-berry. Stem 1¼ to 3 ft. high; leaves ovate, clasping, glaucous beneath, 2½ to 4¾ in. long; peduncles with a gland at the knee; flowers greenish-white, 5 to 6 lines long.—Margin of cold streamlets in the woods: Mendocino Co. to w. Siskiyou Co., thence e. and se. to Modoc and Plumas Cos., 1000 to 5500 ft.; n. to Alas., e. to the Atlantic; Eur., Asia.

25. **DÍSPORUM** Salisb.

Stem erect, branched above, leafy, arising from a short horizontal rootstock. Leaves ovate, sessile, thin, netted-veined. Flowers greenish or white, drooping on a terminal peduncle, solitary, or few in an umbel. Perianth campanulate, deciduous. Filaments filiform, attached within the anthers, above the base. Fruit a berry. (Greek dis, double, and spora, seed, some species with 2 ovules in each cell.)

Flowers greenish, ½ in. long or nearly; style glabrous, entire.
Leaves 1½ to 3 in. long.
Stamens equaling or exceeding the perianth; anthers not hispid; leaves mostly cordate at base.....1. *D. hookeri.*
Stamens generally slightly shorter than the perianth; anthers minutely hispid; upper leaves slightly cordate at base.....2. *D. trachyandrum.*
Leaves 1 to 1½ in. long; stamens ½ the length of perianth; anthers nearly sessile... 3. *D. parvifolium.*
Flowers whitish, ¾ to 1 in. long; leaves 2 to 4 in. long; style densely short hairy, slightly 3-cleft at apex; leaves sub-cordate or rounded at base.....4. *D. smithii.*

286. Disporum hookeri Britt.; *a*, fl. branchlet; *b*, berry. x 1.

1. **D. hóokeri** (Torr.) Britt. Fairy Bells. Fig. 286. One to 2¼ ft. high, thinly puberulent; leaves ovate, cordate at base, abruptly acute or attenuate, 1½ to 3 in. long, the uppermost somewhat oblique; perianth green, narrowly campanulate, 5 to 6 lines long, the tips of the segments spreading; stamens equaling or exceeding the perianth; berry obovoid to subglobose, obtuse, scarlet. — Shady woods back of the immediate coast, Coast Ranges from Santa Cruz Co. to Siskiyou Co.

2. **D. trachyándrum** (Torr.) Britt. Stem 1 to 2 ft. high, purplish and nearly glabrous below, pubescent above; leaves ovate to oblong-ovate, abruptly acute to acuminate, sessile, upper ones very slightly cordate at base, 1 to 2½ in. long; flowers greenish, campanulate with spreading segment tips, nearly ½ in. long, on short drooping pedicels, solitary or in 2s or 3s; stamens slightly shorter than the perianth; anthers minutely hispid; ovary glabrous; style entire; berry obovate, scarlet.—In the Sierra Nevada, Tuolumne Co. to Siskiyou Co.; s. Ore.

3. **D. parvifòlium** (Wats.) Britt. Rather stout, much branched, woolly-pubescent; leaves ovate to broadly lanceolate, the lower cordate and clasp-

ing, 1 to 1½ in. long, acuminate; flowers rather numerous, 4 lines long; segments slightly spreading, twice longer than the lanceolate acute nearly sessile anthers; ovary very small, slightly pubescent; style slightly exserted.—Siskiyou Mts. Our spms. have the stamens more or less exserted with filaments twice the length of the anthers.

4. **D. smíthii** (Hook.) Piper. FAIRY LANTERN. One to 3 ft. high, soft-pubescent or almost glabrous; leaves round-ovate to ovate-lanceolate, rounded or subcordate (and often a little oblique) at base, at apex abruptly acute or attenuate, 2 to 4¾ in. long; perianth whitish, broad and cup-shaped at base, ¾ to 1 in. long, the tips of the segments erect; stamens ⅓ shorter than the perianth; berry yellow, oblong-obovate, attenuate above into a short beak.—Stream banks, Coast Range woods very near the coast: San Mateo Co. to Del Norte Co.; n. to B. C. Apr.

26. **SMILACÌNA** Desf.

Stem simple and leafy, from a horizontal rootstock, bearing a terminal raceme or panicle of small white flowers with minute bracts. Leaves sessile, many-nerved. Pedicels jointed at the summit. Perianth persistent, the segments distinct and spreading. Stamens inserted at the base of the segments; anthers versatile. Style 3-lobed at the summit, persistent; ovules 2 in each cell. Fruit a globose 1 to 3-seeded berry. Seeds sub-globose, with thin testa and horny endosperm. (Diminutive of smilax.)

Flowers in a simple raceme; stamens shorter than the perianth segments; filaments not dilated.
Leaves spirally arranged, often folded.....1. *S. stellata.*
Leaves mostly 2-ranked, commonly flat.....2. *S. sessilifolia.*
Flowers in a panicle; stamens much longer than the perianth segments; filaments dilated..
3. *S. amplexicaulis.*

1. **S. stellàta** (L.) Desf. STAR-FLOWER. Stem ¾ to 2 ft. high; rootstock stout; herbage pale; leaves oblong-lanceolate to lanceolate, acuminate, often somewhat folded on the midrib, sessile and clasping, 3 to 5½ in. long; raceme open, 6 to 20-flowered; pedicels 2 to 6 lines long; perianth segments 2 to 3½ lines long; stamens ⅔ as long as the perianth segments; style nearly equaling the ovary; berry at first with 6 dark-brown longitudinal stripes or bands on a greenish or whitish ground, eventually black.—Crests and e. side of the Sierra Nevada; desert ranges of Mono and Inyo Cos., s. to San Gabriel Mts.; e. to the Atlantic.

2. **S. séssilifòlia** Nutt. SLIM SOLOMON. Similar to S. stellata and perhaps only a variety of it; rootstock slender; herbage bright green; upper part of stem commonly somewhat arcuately curving and the flat leaves disposed to be 2-ranked; leaves oblong-ovate to lanceolate; raceme commonly 3 to 9-flowered; stamens ½ to ¾ as long as the perianth segments; berry red, 1 to 4-seeded, 3 to 5 lines broad.—Common in shady woods and on moist brushy slopes: Coast Ranges, mostly near the coast; Sierra Nevada; n. to Wash.

3. **S. ampléxicáulis** Nutt. FAT SOLOMON. Stem 1 to 3 ft. high, this and the under surface of the leaves with a minute fuzzy pubescence or rarely glabrous; rootstock stout, elongated; leaves oblong-ovate to lanceolate, 3 to 5½ in. long, acute at apex, sessile by a broad clasping base; panicle usually short-peduncled, oblong, 2 to 4 in. long; pedicels 1 line long or less; perianth segments less than 1 line long; filaments lanceolate or broadly subulate, much longer and often broader than the segments; style ½ to nearly as long as the ovary; berry light red, finely sprinkled with dark red dots, 2 to 2½ lines in diameter, usually 1-seeded.—Shady woods, Sierra Nevada and Coast Ranges; n. to B. C. Var. GLÀBRA Mcbr. Leaves broadly oblong; herbage glabrous and slightly glaucous.—High altitudes, Humboldt Co. and Sierra Nevada.

27. **MAIÁNTHEMUM** Webb.

Stem low, from a horizontal rootstock, bearing 2 or 3 broad leaves and a terminal raceme of white flowers, the pedicels solitary or 2 or 3 in a cluster.

Perianth segments 4. Stamens 4, with filiform filaments. Ovary 2-celled; stigma 2-lobed. Fruit a globose red berry. (Latin maius, May, and Greek anthemon, flower, in allusion to the flowering period.)

1. **M. bifòlium** DC. var **kamtschàticum** (Gmel.) Jepson. OREGON COLTSFOOT. Stem simple, erect, 4 to 14 in. high, often stout; leaves ovate- or triangular-cordate, 2 to 4½ in. long; basal leaf cordate, short-pointed, very large, very long-petioled, almost as tall as the flowering stem; raceme peduncled, ½ to 2 in. long; perianth segments oblong or broadest toward apex, slightly unequal, 1 to 1½ lines long, becoming deflexed; berry 3 lines in diameter.—Woods near the coast from Marin Co. to Humboldt Co.; n. to Alas; Asia.

28. CLINTÒNIA Raf.

Stem from a creeping rootstock and bearing at or from beneath the ground a few broad leaves and a scape-like peduncle. Flowers in an umbel or solitary. Perianth resembling a very small lily flower, campanulate, of 6 distinct deciduous segments. Stamens 6, with filiform filaments, inserted on the base of the segments; anthers fixed just above the base, extrorse. Ovary 2 or 3-celled; ovules 2 or 3 in each cell; style slender, slightly 2 or 3-lobed, deciduous. Fruit a smooth ovoid (in ours blue) berry. (De Witt Clinton, 1769-1828, naturalist, several times governor of New York.)

Peduncles much exceeding the leaves; flowers in an umbel.....1. *C. andrewsiana.*
Peduncles shorter than the leaves; flowers solitary.....2. *C. uniflora.*

1. **C. ándrewsiàna** Torr. Leaves commonly 5, sometimes 6, narrowly or broadly elliptic, rather abruptly short-pointed, 7 to 13 in. long, 2 to 4½ in. broad; peduncle 15 to 20 in. high, bearing a terminal umbel of many flowers and with 2 to 4 supplementary clusters borne laterally, the lateral clusters 1 to 9-flowered or rarely none; flowers 5 to 8 lines long, rose-red or pink; filaments slightly pubescent below the middle.—Shady woods near the coast: Monterey Co. to Del Norte Co. The berries suggest small-sized old-fashioned bluing balls.

2. **C. unifìora** Kunth. BRIDE'S BONNET. Leaves 2 or 3, oblong to narrowly elliptic, 4 to 6 in. long, including the short petiole-like base, and ¾ to 2 in. wide, acute; peduncle 1-flowered, shorter than the leaves, commonly with 1 or 2 small bracts; flowers white, 9 to 11 lines long.—Coniferous forests, Sierra Nevada, 3500 to 6000 ft., at scattered stations from Tulare Co. to Lassen Co.; thence w. to Siskiyou and Humboldt Cos.; n. to B. C.

29. SCOLÌOPUS Torr.

Stem very short, subterranean, bearing a pair of broad leaves and an umbel of greenish purple flowers, the peduncle almost obsolete, the sharply angular pedicels (which look like scapes) alone appearing above ground. Stamens 3, opposite the sepals, short, with greenish extrorse anthers. Ovary triquetrous, 1-celled; style short, its 3 long branches abruptly spreading horizontally. Capsule with a membranous wall which bursts irregularly. (Greek skolios, crooked, and pous, foot, in allusion to the tortuous pedicels.)

1. **S. bígelòvii** Torr. SLINKPOD. Fig. 287. Leaves 2 (rarely 3), elliptic to oblong, acute, commonly mottled with dark

287. Scoliopus bigelovii Torr.; *a*, fl. x 1; *b*. habit x ⅙.

splotches, 4 to 9 in. long; flowers with a fetid odor and having something the appearance of orchids; pedicels 4 to 9 in. long, 3-angled, slightly winged, erect in flower, in fruit tortuous recurving or procumbent, the maturing capsule more or less hidden by forest litter; sepals ovate-lanceolate, 7 to 9 lines long, black-veined, abruptly spreading or recurved; petals linear-subulate, as long as the sepals, hardly 1 line wide, erect.—Deep cold shades of the Redwood forest, Santa Cruz Co. to Humboldt Co.; n. to southwestern Ore. Jan.-Mar.

30. **TRÍLLIUM** L. Wake Robin

Stem simple, from a tuberous rootstock, naked below and bearing at the summit a whorl of 3 round-ovate netted-veined leaves and a single large flower. Perianth of 3 lanceolate herbaceous persistent sepals and 3 larger colored petals. Stamens 6, much shorter than the segments; anthers linear, on short filaments, adnate. Ovary 3 to 6-angled, 3-celled or 1-celled at summit. Styles 3, elongated, stigmatic down the inside. Fruit a fleshy reddish capsule. Seeds ovate. (Latin triplum, triple, on account of the 3-merous flowers.)

Flower sessile; leaves sessile.....1. *T. sessile.*
Flower raised on a peduncle.
Leaves sessile or nearly so; peduncle erect.....2. *T. ovatum.*
Leaves petioled; peduncle usually declined.....3. *T. rivale.*

1. **T. séssile** L. var. **gigantèum** H. & A. Common Trillium. Stem stout, sometimes more than one from the same root, 1 to 1¾ ft. high; leaves round-ovate, 2½ to 5 in. long, commonly broader than long; petals obovate to oblanceolate, 1½ to 3 in. long, deep red or lilac, or varying to dull white; capsule long-oval to subglobose, obscurely 6-angled above, circumscissile around the platform-like base.—Brushy or wooded hill-slopes or cañons: Coast Ranges from Monterey Co. n to Siskiyou Co., but not in inner Coast Range; n. to Wash. Feb.-Mar. Var. chloropétalum Torr. Petals yellowish or greenish-yellow.—Monterey Co. to Siskiyou Co. and s. in the Sierra Nevada to Placer Co. The form with pure white petals (Rock Lily) is found from Napa Valley to Humboldt Co. Var. angústipétalum Torr. Leaves 3 to 7 in. long; petals narrowly linear, typically 1 to 3 (rarely 5) lines wide.—Sierra Nevada; San Luis Obispo Co.

2. **T. ovàtum** Pursh. Coast Trillium. Fig. 288. Stem 8 to 10 in. high; leaves ovate to round, sometimes disposed to be rhombic, abruptly acute, 2½ to 5½ in. long; petals oblong-lanceolate to ovate, 1 to 1½ in. long, white changing to deep rose-color; ovary incompletely partitioned above the middle; capsule broadly ovate, the angles projected into narrow wings.—Wooded cañons near the coast from Monterey Co. to Del Norte Co., thence e. to Siskiyou and Shasta Cos.; n. to B. C. and Ida. Mar.-Apr.

3. **T. rivàle** Wats. Stem slender, 4 to 10 in. high; leaves ovate, truncatish to cordate at base, 1½ to 3 in. long; flower on a peduncle 1 to 3¾ in. long; petals white, dotted with purple at the center, about 1 in. long; capsule scarcely angled.—Rocky banks, Del Norte and Siskiyou Cos.; n. to southern Ore.

288. Trillium ovatum Pursh; *a*, fl. stem x ⅛; *b*, capsule x 1.

31. **SMILAX** L. Greenbrier

Stems prickly or smooth, climbing by means of tendrils, arising from a tuberous rootstock. Leaves alternate, netted-veined, the petioles bearing near the base a pair of tendrils. Flowers small, greenish, dioecious, borne in axillary umbels. Perianth segments distinct. Staminate flower with 6 stamens. Pistillate flower usually with 1 to 6 abortive stamens; ovary with 1 or 2 ovules in each cell; style short or none; stigmas 1 or 3. Fruit a berry. (Smilax, a Greek name.)

1. **S. californica** Gray. Stem woody, climbing over shrubs and trees or trailing over the ground, 3 to 6 (or 14) ft. long; leaves ovate, sub-cordate, 2 to 4¾ in. long, on petioles ½ in. long; perianth 5 lines long, its segments 6; berries globose, black, 4 lines in diameter.—Butte Co. to Siskiyou Co., thence s. to Trinity Co.; n. to Ore.

AMARYLLIDACEAE. Amaryllis Family

Perennial herbs with basal leaves. Flowers perfect, regular, the inflorescence borne on a scape-like stem. Perianth 6-parted, the 6 stamens inserted on its tube. Ovary inferior, 3-celled; style 1. Fruit a several to many-seeded capsule.—Amaryllis, Narcissus, and Hypoxis species are extensively cultivated in Cal. gardens.

1. **AGAVE** L. Maguey

Perennial herbs with a basal rosette of leaves on a short or mostly subterranean trunk. Leaves in ours evergreen, fleshy, spine-tipped and margined by prickles. Flowering stem tall, arising from the center of the rosette. Flowers thick and fleshy. Stamens exserted. (Greek agauos, noble.)—A. americana L., Century Plant, is common in California gardens; in Mexico, just before flowering, an individual of this species yields for a long time one or two gallons a day of saccharine juice from which pulque, the national drink of Mexico, is made. A. rigida var. sisalana Engelm., of Mexico, yields Sisal Hemp.

Flowers about 4 in a cluster, the clusters racemosely or subspicately arranged along the terminal axis; stamens inserted at the middle of the perianth-tube. 1. *A. utahensis.*
Flowers many in terminal bunches on the branches of a panicle.
Trunk subterranean or essentially so; stamens inserted at the mouth of the tube.
Ovary fusiform, about twice as long as the perianth segments. . . . 2. *A. consociata.*
Ovary flask-shaped, longer than the perianth segments. . . . . 3. *A. deserti.*
Trunk rising above the ground; stamens inserted at the middle of the tube. . . . . 4. *A. shawii.*

1. **A. utahensis** Engelm. Trunk subterranean; flowering stem 5 to 8 ft. high; leaves thick, hard, 6 to 12 in. long, margined by white teeth and tipped by a spine 1 to 3 in. long; flowers yellow, 1 to 1½ in. long; perianth abruptly expanded above the tube, its lobes 5 to 6 lines long, 3 times as long as the very short free portion of the tube; capsule 1 to 1½ in. long, dark brown.—Death Valley region; Providence Mts.; e. to Utah and Ariz.

2. **A. consociata** Trel. Plants usually forming very dense and commonly circular colonies 3 to 12 ft. broad; trunk none, the leaves densely clustered at the base; scape slender, 6 to 12 ft. high; leaves thick and fleshy, blue-green, 6 to 12 in. long, edged with straight or curved pale teeth and tipped with a slender black spine; inflorescence slender, rather sparse; flowers yellow, 1½ to 2¼ in. long; perianth lobes 7 to 8 lines long, the free portion of the tube only 1½ to 2 lines long; capsule 1¼ to 1¾ in. long, dark brown, abruptly short-pointed at apex.—San Jacinto Mts. to e. San Diego Co.; L. Cal.

3. **A. deserti** Engelm. Similar to A. consociata, the plants forming rather open and more or less circular colonies 5 to 15 ft. broad; scapes stout, 10 to 16 ft. high; leaves whitish-green, 10 to 15 in. long; inflorescence large, dense; capsules 1 to 1⅓ in. long, light brown, rounded at apex.—San Felipe region, e. San Diego Co.

4. **A. shawii** Engelm. Trunk 8 to 12 in. high, regularly leafy, the flowering stem 8 to 12 ft. high; leaves green, glossy, ovate or lanceolate-ovate, acuminate, 8 to 20 in. long, margined with garnet-red hooked prickles; clusters of the panicle congested; flowers greenish-yellow, 3½ to 4½ in. long; peri-

anth lobes 8 to 10 lines long, the free portion of the tube 7 to 9 lines long.—Sw. San Diego Co. near the coast at the boundary, thence into L. Cal.

ÌRIDÀCEAE. Iris Family

Perennial herbs, ours low, glabrous, with stout stems and 2-ranked sword-like and sheathing leaves. Inflorescence terminal. Flowers perfect, with petal-like perianth of 6 divisions in 2 whorls. Stamens 3, on the base of the outer whorl, with extrorse anthers. Ovary inferior, 3-lobed, becoming a 3-celled capsule. Style 3-cleft or rarely entire; stigmas 3.

Stems terete; divisions of the perianth in two unlike whorls.....1. Iris.
Stems 2-edged or -winged; divisions of the perianth alike.....2. Sisyrinchium.

1. ÌRIS L. Flag

Stems terete, from creeping stout rootstocks. Flowers in the axils of spathaceous bracts. Perianth-tube prolonged beyond the ovary; outer segments or sepals obovate above the claw, spreading or recurved; inner segments or petals narrower, erect. Style divided into 3 petal-like branches, each branch with 2 lobes or appendages at summit; stigma a small projecting shelf (stigmatic only on the upper surface) situated on the lower surface of the branch just below the lobes or appendages. Stamens with linear anthers lying close beneath the branches of the style, i.e., opposite them. Capsule oblong, 3-angled. Seeds flattened or turgid, in 2 rows in each cell. (Greek iris, the rainbow, the Greek species of the genus being celebrated for its brilliant colors.)

Rootstock ½ in. thick or more; dying leaves gray or yellow-brown; seeds globular or pyriform.
Plant sturdy; mature leaves as long or longer than stem, 4 to 6 lines wide.....
1. *I. longipetala.*
Plant slender; leaves shorter than stem, 2 to 4 lines wide.....2. *I. missouriensis.*
Rootstock ¼ in. thick or less; dying leaves red-brown; seeds roughly angled, or spherical in no. 3.
Stem 1¼ to 2 ft. high; leaves 3½ to 6½ lines broad, strongly ribbed; pedicels about 1 in. long; perianth-tube commonly ½ in. long.....3. *I. douglasiana.*
Stem commonly less than 1 ft. high; leaves 3 lines broad or less, thickened, ribs less prominent.
Perianth-tube 1½ to 3¾ in. long; pedicels ½ in. long.....4. *I. macrosiphon.*
Perianth-tube ¼ in. long; pedicels ½ to 3 in. long.....5. *I. hartwegii.*

1. **I. longipétala** Herbert. Coast Iris. Stem very stout, compressed, 1 to 2 ft. high; leaves 4 to 6 lines broad, equaling or rather exceeding the flower-peduncles, turning gray or yellow-brown when dying; pedicels ½ to 3½ in. long; bracts scarious at apex, 2½ to 4 in. long, ¾ to 1⅜ in. broad (when spread out); sepals white, veined with violet, or violet above, 3 in. long, 1¼ to 1⅜ in. broad, narrowed to a short claw, the claw with a very prominent ventral ridge which disappears as a thin crest in the middle of the blade; petals light violet, 2¾ in. long, 6 to 7 lines wide; capsule narrowed at each end, 2 in. long; seeds pyriform.—Wet heavy soil, usually forming dense colonies: coastal region from San Francisco Bay to Monterey Co. Apr.

2. **I. missoúriénsis** Nutt. Western Blue Flag. Stem 10 to 24 in. high, exceeding the leaves (or a few leaves scarcely longer), nearly naked except at base; rootstock short, thick; leaves 2 to 4 lines wide, turning gray or yellow-brown when dying; bracts usually opposite, commonly membranous and straw-color, or sometimes thin, herbaceous; pedicels (1 or) 2 to 4 in. long; sepals whitish or pale blue, veined with purple and often with a central yellowish spot; petals pale blue to white, 2 to 2½ in. long, the tube about ¼ in. long; capsule 1½ to 3 in. long, grooved trough-wise on each face, cylindric in outline, or narrowed to both apex and base; seeds globular to pyriform.—Moist places, meadows or wet flats, high mts.: Sierra Nevada (mostly on the crest and east slope, rare on the west slope), s. to the San Bernardino Mts., e. to eastern Inyo Co., n. to Modoc Co., thence sw. at lower altitudes to the inner North Coast Range in Mendocino and Solano Cos. Throughout the Great Basin and n. to B. C. and Dak. July.

3. **I. doúglasiàna** Herbert. Mountain Iris. Stem 1¼ to 2 ft. high, much exceeded by the (3 to 9 lines wide) basal leaves, these reddish at base; bracts broader and less acuminate than in I. macrosiphon; flowers 2 or 3 in a

pair of bracts, mostly cream-color, lavender or azure, often purple or lilac, the pedicels commonly 1 (½ to 1¼) in. long; perianth-tube usually ½ sometimes to 1½ in. long; petals 2 to 3 in. long; capsule narrowly oblong, sharply angled, 1¾ to 2 in. long; seeds spherical (or obovoid).—Common in the Redwood belt and on chaparral slopes in the Coast Ranges near the coast from Monterey Co. n.; rare in the n. Sierra Nevada; Ore. May-June. The color of the flowers is exceedingly variable, but the species may be known from the next by its longer pedicels, shorter perianth-tube and stouter habit. Var. ALTÍSSIMA Purdy. Three to 3¼ ft. high.—Halfmoon Bay.

4. **I. mácrosiphon** Torr. GROUND IRIS. Stems low and slender, nearly naked or commonly clothed with bract-like leaves, much shorter than the basal leaves which are 5 to 12 (or rarely 27) in. long and 1 to 2 lines broad; bracts lanceolate, long acuminate, 2½ to 3½ in. long; flowers 1 or 2, on pedicels 6 to 7 lines long, with slender tube 1½ to 3 in. long; perianth violet-purple or straw-yellow, generally veined or mottled; sepals oblong-obovate or obovate, their lower or middle portion blotched or veined with white, the margin above often undulate; petals oblanceolate, of a uniform color, 1½ to 2¼ in. long; capsule short-oblong, ¾ to 1¼ in. long; seeds roughly angled.—Brushy slopes, 100 to 3000 ft., Coast Ranges from Santa Clara Co. n. to Del Norte Co.; thence se. to Butte. Co. Also s. Ore. Var. PÚRDYI Jepson. Stem clothed with many bract-like leaves; perianth cream-color veined with purple.—Redwood region of Mendocino Co.

5. **I. hartwégii** Baker. SIERRA IRIS. Fig. 289. Stems many, very leafy, 6 to 12 in. high; leaves ¼ in. wide or less; flowers commonly in pairs; pedicels ½ to 3¾ in. long, partly enfolded in the long lanceolate-acuminate bracts, which are borne more or less separate from each other; petals yellow with lavender veins or pale lavender with deeper-colored veins and a yellow median portion; tube 3 to 5 lines long; sepals and petals 1½ to 2½ in. long; capsule short-oblong, obtusely angled, ¾ to 1 in. long; seeds coarsely wrinkled, cubical.—Dry open forest, 2500 to 6000 ft.: w. slope of the Sierra Nevada from Plumas Co. to Kern Co.; s. to cismontane S. Cal.

289. Iris hartwegii Baker; fl. x ½.

2. SISYRÍNCHIUM L.

Stems slender, compressed and usually 2-edged or 2-winged, often geniculate, from fibrous roots, with grass-like or lanceolate leaves and fugacious relatively small flowers in umbels inclosed by 2 sheathing herbaceous bracts, with a scarious bractlet subtending each pedicel. Perianth 6-parted, the divisions alike, spreading. Stamens monadelphous, their anthers alternate with the 3 style branches or stigmas; stigmas thread-like. (Name of Theophrastus for a bulbous plant allied to Iris.)

290. S. bellum Wats.; fl. x 1.

Stems 2-margined; perianth 4 to 7 lines long; spathe bracts generally shorter than or equal to the flowers.
Flowers blue; filaments united to the top; anthers ⅛ to ⅓ as long as the filaments; style entire, stigmas short. . . . . 1. *S. bellum.*
Flowers yellow; filaments united only at base; anthers equal to the filaments; style deeply cleft. . . . . 2. *S. californicum.*
Stems not margined but compressed; perianth 6 to 10 lines long, reddish-purple; outer spathe bract commonly exceeding the flowers. . . . . 3. *S. grandiflorum.*

1. **S. béllum** Wats. BLUE-EYED GRASS. NIGGER-BABIES. Fig. 290. Stems erect, simple or somewhat branching, 10 to 20 in. high; leaves shorter than the stem, 1 to 2½ lines wide; spathes of 2 nearly equal bracts 10 to 16 lines long, inclosing 3 to 7 flowers; perianth purplish (or sometimes very pale) blue, yellow at base, the segments oblong-

obovate, conspicuously 4 to 6-nerved, 4 to 7 lines long, emarginate at apex, with a slender tooth in the notch, the inner narrower; anthers short, sagittate; style abruptly thickened or obclavate at apex (at least when young), divided at tip into 3 short stigmas; capsule globose, 2 to 3 lines long.—Moist grassy slopes, very common throughout Cal., rare in the deserts and arid areas e. of the Sierra Nevada. Mar.-May.

2. **S. califórnicum** (Ker) Dry. Golden-eyed Grass. Stems unbranched, 4 to 12 (or 15) in. high, broadly winged, exceeding the leaves; bracts rather unequal, inclosing 3 to 7 flowers; perianth bright yellow; segments 4 to 6 lines long, 5 to 7-nerved, obtuse or acutish; anthers versatile, 1½ lines long, about equaling the filaments; style cleft to below the middle; capsule obovate-oblong, 4 lines long.—Wet places, infrequent: cismontane S. Cal., Sierra Nevada and Coast Ranges; n. to Ore. Apr.

3. **S. grandiflòrum** Dougl. Scapes 6 to 12 in. high, bright green, exceeding the long-sheathing leaves; spathe 1 to 4-flowered; bracts very unequal, the outer usually much exceeding the broadly campanulate flowers; perianth segments dark reddish-purple, rarely white, 6 to 10 lines long; filaments broad at base, 3 to 4 lines long, united ⅓ their length; anthers versatile, 2 lines long; style 6 to 7 lines long, cleft at apex, the branches thread-like, 1 line long or less; capsule depressed-globose, 6 to 8 lines long.—Moist places, hills and mountain slopes: Lassen and Modoc Cos. w. to Humboldt Co.; n. to B. C., e. to Ida. and Nev. Mar.-Apr.

ORCHIDÀCEAE. Orchid Family

Perennial herbs with corms, bulbs, tuberous roots or rootstocks and sheathing leaves often reduced to scales. Flowers perfect, irregular, bracted, either solitary or in spikes or racemes. Sepals 3, alike. Petals 3, 2 alike; the third petal called the "lip" commonly dissimilar in color, size and shape, often enlarged, sac-like or spurred, in our genera most frequently brought into an inferior position (i.e., on the lower side of the flower), by twisting of the ovary. Filaments united with the single style forming a column; perfect anther 1 (in Cypripedium 2), situated on the apex of the column and just above or behind the stigma, which is a viscid surface facing the lip. Pollen agglutinated into 2 to 8 pear-shaped masses. Ovary inferior, commonly long and twisted, 1-celled. Fruit a 3-valved capsule. Seeds innumerable, minute.

Leaves foliaceous, i. e. the plants with green herbage.
- Flowers solitary or several, showy; lip large and sac-like.
  - Leaves 2 to many, cauline; sepals and petals brown or greenish-yellow ..... 1. Cypripedium.
  - Leaf 1, basal; sepals and petals rose-purple ..... 2. Calypso.
- Flowers many, spicate or racemose; lip various, but not saccate (except in no. 5).
  - Perianth with a spur ..... 3. Habenaria.
  - Perianth spurless.
    - Flowers in a spike.
      - Spike dense and twisted; leaves uniformly green ..... 4. Spiranthes.
      - Spike more slender; leaves with white or light-colored markings ..... 5. Peramium.
    - Flowers in a raceme.
      - Bracts conspicuous, foliaceous (about 1 to 3 in. long); leaves many; sepals 7 to 9 lines long ..... 6. Epipactis.
      - Bracts small or minute; leaves few; sepals 1 to 2 lines long.
        - Leaves 2, near the middle of the stem ..... 7. Listera.
        - Leaf 1, basal ..... 8. Microstylis.

Leaves reduced and scale-like, the whole plant destitute of green herbage.
- Plants white; perianth not gibbous or spurred; lip with saccate base and broad wing-like margins above ..... 9. Cephalanthera.
- Plants reddish-brown or purple, rarely yellow; perianth gibbous over the ovary or spurred; lip without saccate base ..... 10. Corallorrhiza.

1. CYPRIPÈDIUM L. Lady's Slipper

Stems leafy, rough-pubescent, from tufted fibrous roots. Leaves 2 to many, large. Flowers few or solitary, large and showy, leafy bracted. Sepals spreading, in ours seeming as if only 2, the lateral completely or almost completely united into one under the lip, which is an inflated sac with the incurved margin auricled near the base. Column very short, incurved, terminating in a disk-like stigma. Fertile anthers 2, on short filaments, one on each side of the column below the stigma; sterile anther conspicuous, roundish or ovate,

situated on the upper side and over-arching the stigma. (Greek Cypris, Venus, and pedilon, shoe, the saccate lip a fit buskin for the goddess.)

Stem with several alternate leaves, 1 to 2 ft. high.
Petals linear-lanceolate, 1½ to 2 in. long.....1. *C. montanum.*
Petals oblong, 6 to 7 lines long.....2. *C. californicum.*
Stem with 2 opposite leaves, 2 to 10 in. high; sepals and petals lanceolate, 6 to 12 lines long.....3. *C. fasciculatum.*

1. **C. montânum** Dougl. Stem 1 to 2 ft. high, rough-pubescent with short glandular hairs; leaves elliptic- to narrowly-ovate, the largest 5 or 6 in. long and 3 in. broad; flowers 1 to 3, shortly pediceled; sepals and wavy-twisted petals usually dark brown, linear-lanceolate, 1½ to 2½ in. long; lower sepals united almost to the apex, only the lanceolate-subulate tips free; lip 1 in. long, dull white, veined with purple; sterile anther ovate, 4 lines long, on a slender filament; capsule erect or nearly so, oblong, 10 lines long.—Dense woods: Coast Ranges from the Santa Cruz Mts. to Siskiyou Co., thence se. in the Sierra Nevada to Mariposa Co.; n. to Wash. and Ida.

2. **C. califórnicum** Gray. Stem stout, rough-pubescent, 1 to 2 ft. high; leaves ovate-lanceolate (or ovate), acute or acuminate, 3 to 6 in. long, the upper lanceolate and gradually reduced to foliaceous bracts of the long loose raceme; flowers 1 to 6, short-pedicelled, greenish-yellow; sepals ovate, acute, 6 to 8 lines long, the two lower united to the apex, equaling the oblong-linear acutish petals; lip obovoid, white or light rose-color, veined with purple, 8 to 10 lines long, pubescent within at the base; sterile anther rounded and arching, nearly sessile, 2 lines long, equaling the roughened stigma; capsule oblong, reflexed, 8 to 15 lines long.—Marin Co.; Del Norte Co. to Lassen Co.; s. Ore.

3. **C. fâsciculâtum** Kell. Stems slender, 2 to 10 in. high, pubescent, scariously sheathed at base; leaves 2, nearly opposite, ovate to nearly orbicular, 2 to 4 in. long, pale green, with 3 prominent ribs beneath; flowers solitary or 2 to several in a small terminal cluster; sepals and petals lanceolate, acuminate, 6 to 12 lines long, greenish-brown with brown veins; lower sepals wholly united or very nearly so; lip depressed-ovate, greenish-yellow with brown or purplish margin, 4 to 6 lines long; sterile anther oblong, obtuse, equaling the stigma.—Dry open hillsides: Santa Cruz Co.; Plumas Co. to Del Norte Co.; n. to Wash.

2. **CALYPSO** Salisb.

Low herb with a corm and coral-like roots. Stem scape-like, sheathed by a few scale-like leaves, a single petioled leaf at base and a single drooping terminal flower. Flowers large, showy. Sepals and petals similar, equal, distinct; lip sac-like, terminating in 2 short spurs protruding from beneath a winged margin; upper side of sac inside with 3 densely ciliate ridges running from the opening towards the spurs, with 2 short spurs below the expanded apex. Column broadly winged, almost oval, concave, and petal-like; anther hemispherical, borne just below the summit, opening by a lid. (The nymph Calypso in Homer.)

1. **C. bulbòsa** (L.) Oakes. Calypso. Stem 4 to 5 in. high, the sheathing scales 1 to 2 in. long; leaf ovate, cordate or truncate at base, 1¼ to 2¼ in. long; petiole ½ to 1½ in. long; sepals and petals rose-purple, sometimes pale, linear-lanceolate, 9 lines long; lip as long or slightly longer, ovate-inflated, reddish brown and mottled.—Bogs or in leaf-mold in redwood or pine forests from Marin Co. to Siskiyou and Del Norte Cos.; n. to Alas., e. across the continent.

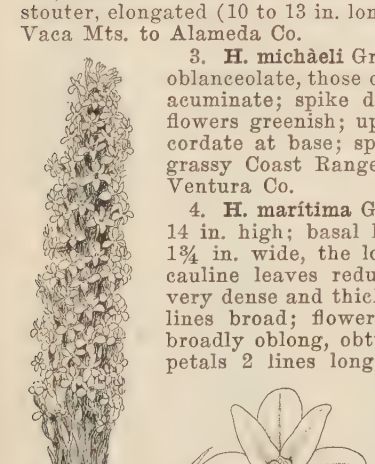
3. **HABENÀRIA** Willd. Rein-orchis

Stems erect, leafy at least at base, solitary from fleshy tuber-like roots. Flowers greenish, yellowish, or white, in a terminal spike or raceme. Sepals equal, the lateral mostly spreading, the petals a trifle smaller. Lip spreading or drooping, in ours entire, produced at base into a long slender spur. Column very short. Anther-sacs more or less divergent. (Latin habena, a thong or rein of a horse, on account of the shape of the spur in some species.)

Stem leafy at base; leaves withering at or before anthesis; lip with a more or less distinct median ridge; upper petals straight.
Spur shorter than the ovary; spike with flowers openly spaced...1. *H. unalaschensis.*
Spur equaling or exceeding the ovary.
Slender, the spike lax, attenuate at tip; flowers whitish.....2. *H. elegans.*
Stout, the spike dense.
Spike narrowly cylindric, rounded in outline at tip; flowers greenish.....
3. *H. michaeli.*
Spike cylindric-conical; flowers white.....4. *H. maritima.*
Stem leafy; leaves remaining until fruit is set; lip flat or concave without median ridge; upper petals inarched and overlapping at tip.
Flowers white; stem thickened; lip rhombic-lanceolate.....5. *H. leucostachys.*
Flowers greenish; stem very slender; lip narrowly linear.
Spur slender, equaling or longer than lip.....6. *H. sparsiflora.*
Spur short, sac-like, shorter than lip.....7. *H. saccata.*

1. **H. ùnalaschénsis** (Spreng.) Wats. Stem rigid, straight, erect, 1 to 2 (or rarely 3) ft. high; leaves 3 or 4, basal, drying up by flowering time, 6 to 8 in. long, the lowest oblong, the upper oblong-lanceolate, longer; flowers greenish or yellowish green, openly spaced on the long tapering spike and exceeding the ovate-lanceolate bracts; perianth segments 1 to 2 lines long; sepals translucent; upper sepal ovate-acute, somewhat deflexed between the greenish petals; lateral sepals and petals oblong-lanceolate; lip ovate, rounded at the apex, rather thick with a prominent ridge down the middle; spur thick, clavate, about equaling, or exceeding the lip, shorter than the ovary; capsule 6 to 8 lines long at maturity.—Dry soil, pine and fir forests: cismontane S. Cal., Sierra Nevada, n. to Siskiyou Co., thence s. to Humboldt Co.; n. to Alas.

2. **H. élegans** (Lindl.) Jepson. Slender, strict, 10 to 14 in. high; basal leaves oblanceolate to lanceolate, 2 to 3½ in. long, those of the stem reduced and acuminate or often almost none; spike slender, laxly flowered, attenuate at apex, 5 to 7 in. long; flowers whitish; upper sepal lanceolate; lip oblong-ovate, obtuse, spur as long as or a little longer than the ovary.—S. Cal. and Coast Range woods mostly near the coast from Monterey Co. n. to Humboldt Co.; Sierra Nevada. Var. ELÀTA Jepson. Taller (to 2⅓ ft. high); spike stouter, elongated (10 to 13 in. long), slenderly attenuate.—Brushy hillslopes, Vaca Mts. to Alameda Co.



291. Habenaria maritima Greene; *a*, spike x ½; *b*, fl. x 2.

3. **H. michàeli** Greene. Stout, 10 to 14 in. high; basal leaves oblanceolate, those of the stem prominent, scale-like, lanceolate-acuminate; spike dense, elongated-oblong, 2½ to 6 in. long; flowers greenish; upper sepal ovate; lip triangular-ovate, subcordate at base; spur ⅓ to ½ longer than the ovary.—Open grassy Coast Range hills or under oaks, Humboldt Co. s. to Ventura Co.

4. **H. marítima** Greene. Fig. 291. Low and stout, 6 to 10 or 14 in. high; basal leaves oblong, acute, 3 to 6 in. long, 1 to 1¾ in. wide, the lowest narrowed to a broad petiole; upper cauline leaves reduced, appressed, lanceolate-subulate; spike very dense and thick, slightly conical, 1½ to 4 in. long, 7 to 13 lines broad; flowers white, with a heavy fragrance; sepals broadly oblong, obtuse, with a green midvein, 2¼ lines long; petals 2 lines long, broadest at the base, ligulate-attenuate above; lip narrowly ovate, with a prominent ridge toward the base; spur slender, longer than the ovary; column short and almost beakless.—Sea-cliffs or coast hills, San Francisco Co. to Humboldt Co.

5. **H. leucóstachys** (Lindl.) Wats. SIERRA REIN-ORCHIS. Fig. 292. Stem thickened below, leafy, ¾ to 2½ ft. high; leaves linear or lanceolate, ¼ to 1⅓ in. broad; flowers white, rather large, in a dense or open spike 4 to 8 in. long; bracts linear-subulate, shorter than the flower; sepals oblong or oblong-ovate, 3 or 4-nerved, thin, 2 to 3 lines long; petals lanceolate, oblique at base; lip slender-

lanceolate from a roundish-dilated base, exceeding the sepals and petals; spur slender, 3 or 4 to 6 lines long, exceeding the lip; beak of the stigma prominent, ovate, more than half the length of the connective; capsule oblong, 6 to 9 lines long.—Common about springs and moist meadows: Sierra Nevada; North Coast Ranges; cismontane S. Cal.; White Mts.; n. to Alas. Var VÍRIDULA Jepson. Lowest leaves elliptic to oblong; flowers greenish. — San Antonio Cañon, San Gabriel Mts.

292. Habenaria leucostachys Wats.; *a*, infl. x ½; *b*, fl. x 1½.

6. **H. sparsiflòra** Wats. Stem very slender, 12 to 20 (or 30) in. high; leaves oblong-lanceolate; flowers greenish, somewhat scattered in the open spike, usually shorter than the bracts; lower sepals reflexed-spreading; lip rather narrowly linear; spur 3 to 4 lines long, equaling or rarely a little longer than the lip; petals deltoid-lanceolate, inarched with tips overlapping; capsule ½ in. long.—Frequent by stream sources, 4000 to 8000 ft.: high North Coast Ranges; Sierra Nevada; San Gabriel and San Bernardino mountains; n. to Ore.; e. to N. Mex. and Col.

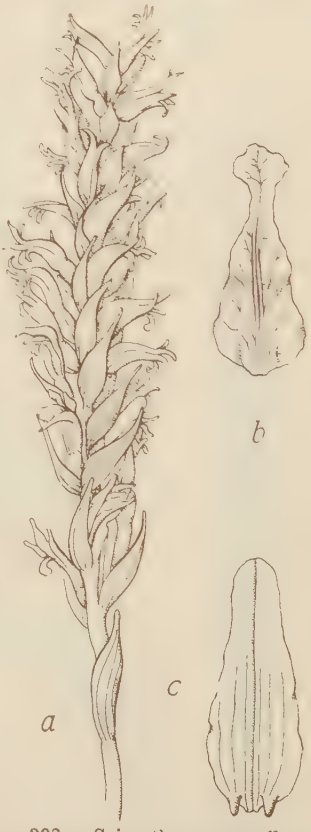
7. **H. saccàta** Greene. Stem slender, ¾ to 2 ft. high; leaves lanceolate or the lowest oblong; raceme lax or medium, its bracts surpassing the green flowers; lip linear, much longer than the short and thick sac-like spur. — Warner Mts., Modoc Co., 5000 to 7500 ft.; n. to Alas.; e. to Col.

4. SPIRÁNTHES Rich.

Stem from a cluster of tuberous roots, erect, leafy. Flowers white, spurless, in 1 to 3 ranks in a twisted spike. Sepals and petals all narrow, erect, in ours united into a short tube at base and more or less connivent into a hood above. Lip sessile or with a short claw, the broad lower portion embracing the column and bearing a protuberance on each side, the apical portion spreading and wavy-crisped. Column short, obliquely inserted on the ovary, bearing the stigma on the front and the sessile or short-stalked erect anther on the back. Capsule erect. (Greek speira, spiral, and anthos, flower, in allusion to the twisted inflorescence.)

Lip roundish at base, narrowed above the middle but strongly dilated at apex; protuberances ridge-like, minute . . . . . 1. *S. romanzoffiana.*
Lip oblong at base, only slightly dilated at apex; protuberances nipple-like, prominent . . . . . 2. *S. porrifolia.*

1. **S. ròmanzóffiàna** C. & S. Fig. 293a, b. Glabrous, 5 to 16 in. high; leaves oblong-lanceolate, 3 to 7 in. long; spike dense, 1½ to 5 in. long, the flowers dull or greenish white, in 3 ranks; bracts conspicuous, ovate, abruptly subulate-pointed, 5 to 6 lines long; perianth 3 to 6 lines long, curved; lip recurved.—Wet meadows, mostly in the higher mountains:



293. *a*, Spiranthes romanzoffiana C. & S.; infl. x 1; *b*, lip x 4; *c*, S. porrifolia Lindl.; lip x 4.

Sierra Nevada (common), Coast Ranges, cismontane S. Cal. (rare); n. to Alas.; e. across the continent. July-Sept.

2. **S. porrifòlia** Lindl. Fig. 293c. Flowers creamy or yellowish white.—Marshy meadows or springy spots, cismontane S. Cal., Coast Ranges, and Sierra Nevada; n. to Wash.

5. PERÀMIUM Salisb. Rattle-snake Plantain

Scape erect, bearing a few sheathing scale-like leaves, a terminal spike, and at base a cluster of petioled white-reticulated leaves. Rootstocks creeping, with fleshy roots. Flowers white, similar to Spiranthes. Lateral sepals free, the upper one united with the petals into an erect galea. Lip sac-shaped, sessile, entire and without callous thickenings at base. Anther without a lid. (Greek pera, a leathern pouch, referring to the lip.)

1. **P. decípiens** (Hook.) Piper. Plants 11 to 15 in. high, glandular-pubescent, especially the scapes and inflorescence; leaves thickish, rosulate, oblong-ovate, acute at both ends, reticulated with white or light-colored veins or markings, 1¼ to 2½ in. long, on petioles ½ to ¾ in. long; flowers 3 to 4 lines long; spike 3 to 5 in. long.—Coniferous woods, Sierra Nevada from Mariposa Co. n. to Modoc Co., thence w. to Humboldt Co. and s. along the coast to Marin Co.; n. to B. C., e. to Quebec. Also in Ariz. (Goodyera menziesii Lindl.)

6. EPIPÁCTIS Haller

Stem leafy from a creeping rootstock. Flowers in a raceme with foliaceous bracts. Sepals and petals nearly equal, spreading; lip strongly constricted at the middle, the lower portion deeply concave, the upper portion dilated. Anther 2-celled, sessile behind the broad truncate stigma, on a slender jointed base; the pollen-masses become attached above to the gland capping the small rounded beak of the stigma. Ovaries reflexed at maturity. (Greek epipegnuo, because used to curdle milk.)

1. **E. gigantèa** Dougl. Stream Orchis. Stout, 1 to 3 (or 4) ft. high, nearly glabrous; leaves ovate below, lanceolate above, acute or acuminate, 3 to 7 in. long; raceme minutely pubescent; flowers 3 to 10, on pedicels 2 lines long; sepals greenish, 7 lines long (exceeding the petals), the upper concave and somewhat carinate; petals rose-color, purple-veined, particularly the lip; lower portion of lip with short erect lobes or wings and with many callous tubercles near the base, the upper portion ovate-lanceolate, crested or ridged toward the base.—Moist stream banks: mts. throughout Cal.; n. to Wash., e. to Col. and Tex. May.

7. LÍSTERA R. Br. Twayblade

Stem low, bearing a pair of broad sessile opposite leaves at the middle, and arising from a cluster of fibrous creeping roots. Flowers small and greenish, in a loose raceme. Perianth spreading or reflexed; sepals and petals similar; lip free, longer than the sepals, flat and dilated, more or less deeply bifid. Column free, bearing the ovate anther naked (without lid) at the back of the summit. Pollen-masses 2, powdery, united to a very minute gland upon the rounded entire beak of the stigma. Capsule ovoid. (Martin Lister, 1638-1711, a celebrated English naturalist.)

Leaves orbicular or ovate; raceme pubescent.
Lip 4 to 5 lines long, distinctly obtuse-lobed at apex, clawed at base..... 1. *L. convallarioides.*
Lip 1½ to 2 lines long, apex rounded with a shallow notch bearing an inconspicuous tooth, base sessile with a short subulate tooth on each side....2. *L. caurina.*
Leaves deltoid-cordate; raceme glabrous; lip sharply cleft to the middle into 2 attenuate lobes.....3. *L. cordata.*

1. **L. convallàrioides** Torr. Stem slender, ¼ to 1 ft. high, pubescent above the leaves; leaves orbicular to broadly ovate, often abruptly acute, or obtuse at apex, 1 to 3 in. broad; flowers 6 to 12, greenish, on short pedicels; sepals and petals linear to linear-lanceolate, about 2 lines long; lip narrowly cuneate-obovate, 4 to 5 lines long, distinctly 2-lobed at the dilated apex, toothed on each side at base just above the short but slender claw, the basal papillae

very minute or none; capsule 4 lines long.—Moist shaded places in the mts., 3500 to 6000 ft.: San Jacinto Mts.; North Coast Ranges from Mendocino Co. to Siskiyou Co.; Sierra Nevada from Tuolumne Co. to Shasta Co.; n. to Alas.; e. to Newf.

2. **L. caurìna** Piper. Stem very slender, 4 to 6 in. high, pubescent above the leaves; leaves ovate, acute or obtuse, sessile by a clasping base, 1 to 1½ in. long; bracts ovate, acute, ⅓ the length of the pedicels; flowers 5 to 15, greenish, very small, on pedicels 2 to 3 lines long; sepals and petals lanceolate to linear-lanceolate, 1 to 1½ lines long, spreading; lip 1½ to 2 lines long, cuneate, with an inconspicuous tooth in the shallow notch at the rounded apex and a short subulate tooth on each side at the base, a papilla at the base of each tooth; column short, not stout; capsule 3 lines long.—Damp woods, high mts.: Humboldt Co.; Ore. to Ida. and Alas.

3. **L. cordàta** (L.) R. Br. Stem slender, 2 to 8 in. high; leaves deltoid-cordate, ½ to 1¼ in. broad, mucronate; raceme glabrous; flowers 6 to 24, purplish or yellowish; sepals ovate, about 1 line long; petals broadly oblong, ¾ line long; lip narrow, twice the length of the petals, cleft to the middle into two attenuate lobes, and bearing an orbicular ridge at its base and a subulate basal tooth on each side; column very short; capsule 2 lines long.—Humboldt Co.; n. to Alas., e. to N. Eng.; Eur., Asia.

8. MICROSTÝLIS Nutt.

Low herbs with simple stems and a single leaf from a solid bulb. Flowers many, minute, greenish, in a raceme. Sepals oblong. Petals linear or filiform. Lip auricled or ovate at base, acute at apex, entire. Column with 2 teeth at summit, the erect anther between them. (Greek micros, small, and stylis, style, referring to the very small column.)

1. **M. monophýllos** (L.) Lindl. Plants slender, 4 to 5 in. high; leaf ovate, 1 to 2 in. long, narrowed at base to a petiole nearly as long; perianth segments 1 to 1½ lines long; pedicels as long as the ovary.—High montane (8000 ft.), wet places, rare in Cal.: South Fork Mdws., Santa Ana River, San Bernardino Mts.; e. N. Am.; Eurasia.

9. CÉPHALANTHÈRA Rich.

Stem from a creeping rootstock, bearing medium-sized flowers in a bracted spike. Leaves in ours reduced to scarious sheaths. Sepals and petals nearly equal, connivent, the latter somewhat united and galeate, not gibbous at base. Lip free, concave, contracted and somewhat jointed in the middle. Column slender, elongated. Anther shortly stipitate, so as to be nearly or quite above the level of the top of the stigma. Pollen-masses not connected nor attached to a gland. Stigma wholly beakless. (Greek cephale, head, and anthera, anther.)

1. **C. áustinae** (Gray) Hel. Phantom Orchis. Symbiotic saprophyte, the whole plant white, 10 to 20 in. high; rootstock upright with mycorhizal rootlets; leaves 3 to 6, 1 to 2 in. long; flowers many to numerous; sepals and petals similar, oblong-lanceolate, ½ to ¾ in. long; lip shorter, its middle lobe hinged, 3 to 5-ridged within, the ridges thin; upper sepal and the 2 petals approximate-curving and forming a hood over the column; column 2 lines long, about twice longer than the anther.—Dense mountain forests: Coast Ranges from Monterey Co. to Humboldt Co., and Sierra Nevada from Fresno Co. to Shasta Co.; n. to Ore. Very rare.

10. CORÁLLORRHÌZA R. Br. Coral-root

Brownish or yellowish saprophytes or root-parasites, destitute of green herbage, and with branching toothed coral-like roots. Stems scape-like, the leaves reduced to scales, and bearing the flowers in a terminal raceme. Perianth segments oblong or lanceolate, nearly alike, ours 3-nerved, gibbous at base over the ovary, or the lateral sepals united at base with the foot of the column, forming a short spur which is adnate to the summit of the ovary. Lip 1 to 3-ridged. Column 2-edged, slightly incurved. Anther terminal,

opening by a lid. Pollen masses 4, soft-waxy. Capsules reflexed. (Greek korallion, coral, and rhiza, root.)

Perianth 3 to 4 lines long, the lateral sepals with a spur at base.
Spur wholly attached to the ovary; lip broad, 3-lobed, spotted.....1. *C. maculata.*
Spur free for its apical half; lip oblong, entire, or toothed at base, dark red.....
2. *C. mertensiana.*
Perianth 6 to 8 lines long, gibbous at base; spur none; lip entire, purple-veined.....
3. *C. striata.*

1. **C. maculàta** Raf. Stems 8 to 13 in. high; raceme 2 to 7 in. long; sepals and petals brownish-purple, 3-nerved, 3 to 4 lines long; lateral sepals united at base with the foot of the column forming a short (1 line long) spur which is adnate to the ovary; lip white, conspicuously spotted with purple, broadly ovate and somewhat convex, 3-lobed by a deep cleft on each side; middle lobe denticulate at apex; capsule ¾ in. long.—Mountain woods, mostly 3000 to 6000 ft.: cismontane S. Cal., n. through the Coast Ranges and Sierra Nevada to Siskiyou Co.; n. to B. C., e. to the Atlantic.

2. **C. merténsiàna** Bong. Stems 6 to 20 in. high; raceme more open than in C. maculata, its axis lurid-purple; flowers reddish tinged or veined with purple; sepals and petals linear-lanceolate, 3 to 4 lines long; upper sepal erect, covering closely the two petals; lower sepals deflexed-spreading; spur 1 line long, the lower half free from the ovary; lip dark red, oblong, obtuse, entire or with a tooth on one or both sides near the base, clawed below, thin and concave, the ridges only slightly prominent; capsule 5 to 8 lines long, attenuate into the short slender pedicel.—Woods, Humboldt and Siskiyou Cos.; n. to Alas.

294. Corallorrhiza striata Lindl.; fl. x 2.

3. **C. striàta** Lindl. Fig. 294. Stems many in a cluster, 8 to 20 in. high, with 3 or 4 sheathing leaves; raceme 2 to 8 in. long; sepals and petals somewhat flesh-colored, striately 3-nerved with purple or reddish brown lines, about 6 lines long, approximated on upper side of flower and curved over column in such a way as to form a sort of hood; lateral sepals oblique; lip quite entire, its edge a little upturned; spur none but the base of the perianth prominently gibbous over the ovary; capsule 6 to 9 lines long.—Woods along the coast from Santa Cruz Co. to Humboldt Co.; Sierra Nevada from Fresno Co. to Modoc and Siskiyou Cos.; n. to B. C., e. to Ont.

DICOTYLEDONS

Leaves netted-veined. Stem increasing in diameter by an annual layer of wood inside the bark. Flowers with the parts in 4s or 5s, the perianth commonly differentiated into calyx and corolla, sometimes absent. Embryo with 2 cotyledons.

CHORIPETALAE

Calyx usually present, sometimes petal-like. Corolla present or absent, when present consisting of distinct or nearly distinct petals.

SALICÀCEAE. Willow Family

Trees or shrubs of rapid growth, light wood and bitter bark. Leaves simple and alternate, with stipules. Flowers dioecious, borne in catkins, these falling off as a whole, the staminate after shedding the pollen, the pistillate after ripening of the fruit and dispersion of the seeds. Bracts of the catkin scale-like. Calyx and corolla none. Stamens 1 to many. Ovary 1-celled; stigmas 2 to 4. Fruit a 2 to 4-valved capsule, enclosing many seeds furnished with a tuft of hairs at base.

Scales entire or merely denticulate, persistent; flowers without disk; stamens usually 1 to 5; stigmas short; pods small, ovate or narrow.....1. Salix.
Scales fimbriate or lacerate, caducous; flowers with a broad disk; stamens usually numerous; stigmas elongated or conspicuously dilated; pods larger, nearly globose.....
2. Populus.

1. SÀLIX L. Willow

Trees or shrubs with mostly narrow short-petioled leaves. Winter buds covered by a single scale. Catkins mostly erect, appearing before or with the leaves; scales entire or merely denticulate, persistent or at least not caducous. Staminate flowers with 1 to 9 stamens and 1 or 2 little glands. Pistillate flowers with a gland at the base of the ovary. Stigmas short. (Ancient Latin name of the willow.)

A. Filaments of the stamens woolly or hairy below.

Stamens 3 to 9; style short; stigmas roundish, subentire; scales pale or yellowish, in the pistillate catkin more or less deciduous by maturity; capsules pediceled; trees, mainly of lower altitudes.
- Petioles with wart-like glands at summit; leaves lanceolate, long-pointed; stipules usually present, roundish; catkins in bud tapering, in flower usually straight, their scales erect ..... 1. *S. lasiandra.*
- Petioles not glandular; stipules usually absent; catkins in bud cylindric.
  - Leaves broadly lanceolate, acute, usually glaucous beneath; staminate catkins curving; scales reflexed or spreading ..... 2. *S. laevigata.*
  - Leaves very narrow, nearly alike on both faces, finely serrulate, often curving towards apex ..... 3. *S. nigra.*

Stamens 2; scales pale, somewhat deciduous; catkins borne on short leafy branchlets, often clustered.
- Filaments distinct; branchlets reddish brown or drab; leaves narrowly linear or lanceolate (1½ to 4 or 6 lines wide); shrubs or small trees of stream beds at mostly lower altitudes.
  - Stigmas linear, 3 to 4 times longer than broad, raised on a distinct style; ovary sessile, densely silky; leaves silvery or green ..... 4. *S. sessilifolia.*
  - Stigmas oblong, roundish, or ovate, sessile or nearly so.
    - Capsule glabrous.
      - Ovary short-pediceled; leaves green, glabrous or nearly so; cismontane. 5. *S. melanopsis.*
      - Ovary sessile; leaves silky-pubescent below; mostly transmontane ..... 6. *S. exigua.*
    - Capsule pubescent or pilose; ovary short-pediceled; leaves silky when young, more or less glabrate when mature ..... 7. *S. argophylla.*
- Filaments united at very base; pedicels long (about half as long as the ovary); leaves oblong-lanceolate, 2 to 4 lines wide, silky-pubescent; branchlets conspicuously glaucescent ..... 8. *S. geyeriana.*

B. Filaments of the stamens glabrous or mainly so; stamens 2 (1 or 2 in no. 10).

Style none; leaves obovate; catkin-scales black, with white hairs ..... 9. *S. scouleriana.*
Style conspicuous or at least evident.
- Filaments conspicuously united above the base (sometimes distinct in no. 14).
  - Trees or shrubs.
    - Capsule silky or pubescent.
      - Leaves with a white felt-like tomentum on under surface; catkins long and slender ..... 10. *S. sitchensis.*
      - Leaves glabrous; catkins short (oblong to elliptic) .. 11. *S. phylicifolia.*
    - Capsule essentially glabrous; peduncles of the catkins short (and mostly leafless) or none; style long.
      - Leaves dark green and glabrous above, whitish or pale blue and commonly puberulent beneath; capsules very shortly pedicelled (½ line or less).
        - Capsule not beaked; hill and valley country, common ..... 12. *S. lasiolepis.*
        - Capsule warty-beaked; north coast, rare ..... 13. *S. piperi.*
      - Leaves glabrous, dark or yellowish green above, only slightly paler beneath; capsules with conspicuously long (1 to 2 lines) pedicels.
        - Branchlets brownish or greenish; leaves 2 to 4 in. long ..... 14. *S. cordata.*
        - Branchlets yellow; leaves 1 to 2 in. long ..... 15. *S. lutea.*
    - Stems trailing, forming mats on the ground (2 to 4 in. high); alpine ..... 16. *S. petrophila.*
  - Filaments free.
    - Leaves glabrous and slightly glaucous beneath; Sierra Nevada .. 17. *S. lemmonii.*
    - Leaves pubescent beneath.
      - Leaves silky or villous-tomentose beneath.
        - Leaves entire, not glandular, long silky on both surfaces; high montane ..... 18. *S. glauca.*
        - Leaves minutely glandular-serrate; gray villous or glabrate; high montane ..... 19. *S. commutata.*
      - Leaves whitened beneath with a thin close felt; dry inner Coast Range ..... 20. *S. breweri.*

1. **S. lasiándra** Benth. Yellow Willow. Fig. 295. Tree 20 to 45 ft. high, the trunk with brown roughly fissured bark; one-winter-old branchlets yel-

lowish; winter buds keeled on the back, short and blunt; young leaves lanceolate or oblanceolate, acuminate, glandular-serrulate, with small suborbicular stipules; mature leaves lanceolate with long tapering or very slender point, 4 to 7 in. long, ⅝ to 1¼ in. wide; petioles 3 to 9 lines long, glandular at the upper end; stipules on vigorous shoots conspicuous, orbicular, 5 to 12 lines broad; staminate catkins 1¼ to 3 in. long, usually straight, 5 to 6 lines thick; pistillate catkins 1¼ to 2¼ in. long, 2½ to 3 lines thick; scales erect, oblong-lanceolate, thin, nearly or quite glabrous on the back, hairy at base, the staminate yellow, the pistillate brown and mostly deciduous in fruit; stamens 4 to 9; ovary and capsule glabrous.—Banks of living streams in the Coast Range, Sacramento and San Joaquin valleys and Sierra Nevada foothills (but ascending to 4500 to 8500 southw.) and s. to S. Cal.; e. to N. Mex., n. to Yukon. Var. LANCIFÒLIA Bebb. Branchlets more or less pubescent; leaves smaller, narrower, less serrulate; petioles less glandular.—Sierra Nevada from Plumas Co. to Fresno Co., 3500 to 8500 ft.; San Bernardino Mts.; Waltham Creek, Fresno Co.; Santa Cruz. (Var. abramsii Ball.)

295. Salix lasiandra Benth.; *a*, leaf x ½; *b*, staminate catkin x ⅔; *c*, pistillate catkin x ⅔.

2. **S. laevigàta** Bebb. RED WILLOW. Fig. 296. Tree 20 to 50 ft. high, the trunk bark roughly fissured; one-winter-old branchlets reddish brown, glabrous; winter buds ovate, pointed; young leaves broadly oblong, acute at each end, disposed to be broadest above the middle, mucronate, entire, soon becoming serrulate; stipules minute and caducous or none; mature leaves oblong-lanceolate to lanceolate, obtusish at base, acute at apex or sometimes long-pointed, serrulate, glabrous, green and shining above, pale or conspicuously glaucous beneath, 2½ to 7½ in. long, ⅝ to 1¼ in. broad; petioles 1 to 5 lines long; staminate catkins commonly flexuous, 1½ to 4½ in. long, 4 or 5 lines thick; pistillate catkins ¾ to 2 in. long, 2 lines thick; scales soon spreading or reflexed, elliptic, blunt, woolly at base, glabrous and pallid towards apex, 2 to 4-toothed, the staminate yellow, the pistillate gray and tardily deciduous; stamens 4 to 7 (sometimes 3); ovary and capsule glabrous.—Along living streams, valleys and foothills, 20 to 4500 ft., throughout cismontane Cal.; e. to Ariz. and Utah. Var. ARAQUÍPA Ball. Small tree; one-winter-old branchlets tomentulose; catkins long and dense.—Dry gulches, Solano and Sonoma Cos. to San Diego Co.

296. Salix laevigata Bebb; *a*, leaf; *b*, staminate catkin; *c*, pistillate catkin. x ⅔.

3. **S. nìgra** Marsh. var. **vallícola** Dudley. BLACK WILLOW. Tree

commonly 20 to 50 ft. high with rough dark bark; branchlets brittle at the base; mature leaves narrowly lanceolate, long-pointed, often falcate, serrulate, glabrous, green on both surfaces, 2 to 7 in. long, 2 to 4 (or 8) lines wide; petioles 1 line long; stipules early deciduous; scales of catkins obovate, yellow, hairy, erect; staminate catkins 1½ to 2½ in. long; stamens 3 to 5; pistillate catkins ¾ to 1¼ in. long, in fruit 1 to 2½ in. long, becoming rather lax; ovary scantily pubescent or hoary; capsule glabrous, reddish brown.—River banks, Sacramento and San Joaquin valleys and lower Sierra Nevada foothills and s. to S. Cal.; thence e. to Tex., s. to Mex. (S. gooddingii Ball. S. nigra Jepson.)

4. **S. séssilifòlia** Nutt. var. **hindsiàna** And. SANDBAR WILLOW. Shrub with slender stems 5 to 14 ft. high forming clumps in river bottoms; foliage silvery or becoming more or less green; leaves linear, usually tapering to the acute apex and to the narrow but short petiole-like base, entire, 1 to 3 in. long, 2½ to 5 lines broad, thinly villous on both surfaces and green, or densely villous and silky, especially on young or sterile shoots; no stipules; catkins terminal on leafy branchlets; staminate catkins ⅓ to 1 in. long, slender (2 lines thick), in bud usually cylindric, the scales with acute green tips; gland long and slender; pistillate catkins ¾ to 1 in. long, 3 lines thick, often not dense; ovary sessile, densely silky; style present, stigmas deeply cleft into linear lobes; capsule densely silky, or glabrescent and brown.—Abundant in flood beds of streams of the Coast Ranges, Great Valley, and Sierra Nevada foothills. Passing, in Tulare Co., into the var. LEUCODENDROÏDES Schn. Leaves 3 to 6½ in. long, finely but remotely denticulate; style very short; stigmas shorter than in the species.—Ventura Co. to San Diego Co.

5. **S. melanópsis** Nutt. var. **bolanderiàna** Schn. LONGLEAF WILLOW. Shrub 5 to 15 ft. high with bright green foliage; leaves mostly glabrous, or sometimes minutely canescent, lanceolate or linear, tapering to apex and to a short petiole at base, remotely serrulate with cuspidate teeth, 2 to 5½ in. long, 1½ to 6 lines broad; catkins terminal on leafy branches; staminate catkins ½ to 1⅛ in. long, 2 lines thick; pistillate catkins ½ to 1 in. long; ovary pediceled or sometimes nearly sessile, glabrous; stigmas very short, sessile, cleft into short-ovate lobes; scales densely woolly, mostly ovate; fruiting catkin 1¼ to 2½ in. long; capsule glabrous, the pedicels short (⅕ to ⅛ as long).—Stream beds in valleys and foothills and into the mts. to 4000 or even 6300 ft.: Sierra Nevada from Kern Co. to Shasta Co.; Great Valley; Coast Ranges from Alameda Co. to Siskiyou Co. (S. longifolia Jepson.)

6. **S. exígua** Nutt. NARROW-LEAF WILLOW. Shrub, 8 to 16 ft. high; leaves narrowly linear to lanceolate or oblanceolate, glandular-serrulate or entire, bluish-green and pubescent or subglabrous above, pubescent or white-silky below, 1¼ to 3 in. long, 1 to 2 lines wide; catkins similar to no. 5, the pistillate very slender; capsule glabrous, shortly pediceled, very obtuse at apex or even somewhat excavated, the short stigmas sessile; stigmas bifid into ovate or oblong lobes.—East side of the Sierra Nevada, s. to the Colorado Desert, thence w. to Ventura and San Diego Cos.; Nev. to Alb. Var. PARISHIÀNA Jepson n. comb. Often more silky; a very short style often evident.—Ojai Valley to San Bernardino and San Diego Co.; an ill-defined form. (S. parishiana Rowlee.)

7. **S. argophýlla** Nutt. COYOTE WILLOW. Shrub 5 to 12 or 20 ft. high; leaves narrowly linear to lanceolate or oblanceolate, often falcate, denticulate or entire, 1 to 2½ in. long, 2 to 3 lines wide, at first silky, more or less glabrate; ovary hairy, short-pediceled; stigmas oblong or linear; capsules hairy.—Stream beds: Klamath River; South Coast Ranges; coastal S. Cal.; e. side of the Sierra Nevada; n. to Ida.

8. **S. geyeriàna** And. var. **argéntea** (Bebb) Schn. SILVER WILLOW. Slender shrub 6 to 16 ft. high with numerous stems from the base and very slender white-glaucous branchlets; leaves lanceolate, acute at base, acuminate at apex, entire, 1 to 1½ in. long, 2 to 5 lines wide, becoming green above, appressed silky beneath and imparting a silvery sheen, or glabrate and pale; petioles 1 to 3 lines long; catkins short-peduncled with 2 or 3 leafy bracts.

the staminate 4 to 6 lines long and 3 lines thick, the pistillate 3 to 4 lines long and 1½ to 2 lines thick; scales dark or yellowish, rounded; filaments united at base, densely long-hairy below; style (none or very short); ovary hoary; stigmas ovate, entire or emarginate; fruiting catkins ½ to ¾ in. long, about as thick; capsule 2 to 3 lines long, light brown, puberulent, the pedicels about half as long.—Sierra Nevada, 7000 to 9000 ft.: Volcano Creek, Tulare Co.; Lyell Fork near Mt. Lyell; Mono Co.; Twin Lakes, Alpine Co.; Plumas Co.; e. to Col., n. to Ida. (S. macrocarpa Nutt. var. argentea Bebb.)

9. **S. scouleriàna** Barr. NUTTALL WILLOW. Shrub 2 to 15 ft. high or a small tree to 25 ft. high; branchlets with whitish or commonly with very dark bark; leaves broadly obovate or oblong-obovate, entire, rounded at apex or shortly acute, 1 to 1½ (or 4) in. long, ½ to 1½ in. broad, yellow-green and lustrous above, yellow-veined, glabrate or densely short-silky beneath; petioles 4 lines long; catkins appearing before the leaves, oblong or elliptic, ½ to 1 in. long, 5 to 7 lines thick, sessile; bracts obovate, rounded at apex, black or black tipped, covered with white hairs; stamens 2, conspicuously long-exserted, filaments glabrous; ovary white-silky; style none, stigmas broadly linear, sometimes notched at apex; capsule less silky than the ovary.—Montane, 4000 to 10,000 ft., San Bernardino Mts. and Sierra Nevada; along the immediate coast from Monterey Co. and Alameda Co. to Del Norte Co.; n. to Alas., e. to the Rocky Mts. (S. flavescens Nutt. S. brachystachys Nutt. S. scouleriana var. crassijulis And.)

10. **S. sitchénsis** Sanson var. **còulteri** Jepson n. comb. VELVET WILLOW. Tree or shrub, 5 to 25 ft. high, the trunk 2 to 10 in. in diameter; leaves thickish, obovate to oblanceolate, rounded or shortly acute at apex, entire (obscurely serrulate on vigorous shoots), dark green and almost glabrous above, densely tomentose and lustrous silky beneath, 2 to 5 in. long, 1 to 3 in. broad; petioles 1 to 6 lines long; stipules small, early deciduous or on sterile shoots broad or orbicular, 4 to 6 lines long; staminate catkins 1¼ to 2 in. long, 5 to 6 lines thick; stamen 1; pistillate catkins ¾ to 2 in. long and 3 lines thick, or in fruit 3 to 5 in. long; bracts covered with long white silky hairs, the staminate rounded at apex, the pistillate shorter, broader and more acute; style elongated, stigmas short-oblong, entire or nearly so; capsule silky-tomentose.—Near the coast from Santa Barbara to Marin Co. and Humboldt Co., passing into the species northw. Var. PARVIFÒLIA Jepson n. comb. Leaves oblanceolate, acute, ¾ to 1¼ in. long, 3 to 4 lines wide.—Mendocino Range. (S. sitchensis f. parvifolia Jepson.) Var. RALPHIÀNA Jepson n. comb. Leaves oblong-oblanceolate, obtuse; stamens 2; style elongated; stigmas very deeply cleft; otherwise similar to the species.—Tulare Co., about 6000 ft. (S. sitchensis f. ralphiana Jepson.) Var. ANGUSTIFÒLIA Bebb. Leaves linear- to oblong-oblanceolate, acute, 1 to 4½ in. long; stamens 2; style short; fruiting catkins shorter than in the species (½ to 1½ in. long).—Montane, 7000 to 8700 ft., Sierra Nevada from Placer Co. to Madera Co. (S. jepsonii Schn.)

11. **S. phylicifòlia** L. var. **mónica** Jepson n. comb. MONO WILLOW. Procumbent or erect branching shrub, 1 to 2 ft. high; branchlets dark red; leaves ovate, acute at apex, acutish at base, entire or obscurely and remotely serrulate, bright green above, slightly pale below, glabrous or nearly so, ⅓ to 1¼ in. long, 3 to 6 lines broad; petioles 1 to 3 lines long; stipules none; scales roundish-ovate, hairy; catkins oblong or elliptic, densely flowered, sessile or subsessile, 3 to 6 lines long, bracts none or few and small; fruiting catkins 8 to 9 lines long; style medium sized, stigmas entire or 2-cleft; capsule pubescent, short-pediceled or subsessile, 2 lines long.—Sierra Nevada, local in Tuolumne and Mono Cos., 9000 to 11,000 ft.: Bloody Cañon; Mono Pass; Tuolumne Soda Sprs. This willow forms dense colonies 10 to 100 yards across; it is dominant on about 15 acres below Mt. Dana saddle. (S. monica Bebb. S. planifolia Pursh var. monica Schn.)

12. **S. lasiólepis** Benth. ARROYO WILLOW. Shrub or tree 10 to 18 or rarely 35 ft. high, the trunk 3 to 7 in. in diameter with smooth bark; mature leaves oblong, obovate or linear, acute, obscurely serrulate, green and glabrous

above, white-pubescent or pale beneath, 1½ to 5 in. long, ⅓ to 1¼ in. broad; petioles 1 to 8 lines long; catkins appearing before the leaves, sessile, densely silky tomentose in the bud, suberect; scales dark; staminate catkins ¾ to 1½ in. long, 5 to 6 lines thick; stamens 2, filaments glabrous, more or less united below; pistillate catkins ¾ to 1 in. long, 3 to 4 lines thick, in fruit 1½ to 2¼ in. long; style medium, stigmas 2; capsules glabrous or puberulent, short-pediceled.—Beds of summer-dry arroyos and banks of living streams, valleys and foothills, 10 to 2000 ft., ascending to 4000 or 5000 ft. southw., the most common willow throughout cismontane Cal.; s. to L. Cal., e. to Ariz. (S. bakeri Seem.) Var. BIGELÒVII Bebb. Leaves broadly obovate or cuneate-oblong, obtuse entire, ¾ to 1⅜ in. broad; catkins on short leafy peduncles.—San Francisco Bay region.

13. **S. pìperi** Bebb. DUNE WILLOW. Shrub or small tree 5 to 20 ft. high; leaves broadly oblong or elliptic, abruptly acute to obtuse, serrulate to entire, green and glabrous above, lead-color or glaucous-hue beneath, glabrous beneath or when young soft-puberulent, 2½ to 4 in. long; catkins similar to no. 11; fruiting catkins 1½ to 4 in. long.—Sand-dunes along the north coast: Humboldt Bay; Dow's Prairie; Del Norte Co.; n. to Wash.

14. **S. cordàta** Muhl. Shrub; leaves oblong-lanceolate, narrowed to the subcordate or truncate base and tapering into the pointed apex, entire or serrulate, glabrous, dark green above, paler or glaucous beneath, (1 or) 2 to 4 in. long, ½ to ¾ (or 1½) in. broad; petioles 1 to 3 lines long; stipules orbicular, early deciduous or none; catkins subsessile or shortly peduncled, dense, 1 to 1½ in. long, 3 to 4 lines thick; scales narrow, dark or black, the lower part villous with long white hairs; stamens 2, filaments glabrous, elongated, free or more or less united; style long, stigmas short, bifid; fruiting catkins 1 to 1¾ in. long; ovary and capsule glabrous; pedicels 1½ to 2 lines long.—Montane, 4000 to 7000 ft., Sierra Nevada: Yosemite Valley; Calaveras Co.; Siskiyou Co.; n. to Ore., e. to N. Eng. Rare in Cal. (S. cordata var. mackenziana Jepson.)

15. **S. lùtea** Nutt. var. **watsònii** (Bebb) Jepson n. comb. Shrub 5 to 10 ft. high; branches smooth, glabrous, polished, yellow; leaves yellowish green, oblong and short-acuminate to oblong-lanceolate, serrulate or subentire, 1 to 2 in. long; stipules small or none; catkins ½ to 1 in. long, dense; capsule glabrous; pedicel ½ to 1¾ lines long.—High montane, 6000 to 9000 ft.: San Jacinto Mt.; Panamint Range; n. Sierra Nevada (Sierra Co. acc. Bot. Cal. 1:86); e. to Utah. (S. cordata var. watsonii Bebb.) Var. NIVÁRIA Jepson n. var. Six to 10 ft. high; young leaves silky; branchlets very dark brown, minutely puberulent; styles long.—Near snow banks, Snow Creek, San Bernardino Mts. (Jepson 5575, type).

16. **S. petróphila** Rydb. ALPINE WILLOW. Stems with very short often tortuous branches forming a small depressed or prostrate plant body; flowering shoots 1 to 6 in. high; leaves oblong- or ovate-lanceolate, entire, scantily pilose, 3 to 8 lines long, 2 to 5 lines broad; catkins on erect leafy peduncles, densely flowered, ⅓ to ¾ in. long, the pistillate 1 to 2 in. long; peduncles in fruit 1 to 2 in. long; glands 2 to each staminate flower; style long, stigmas 2-cleft; capsule white woolly or glabrescent and brown, subsessile, 2 to 3 lines long.—Sierra Nevada, 9000 to 11,000 ft.: Mt. Whitney, Mt. Brewer, Mt. Goddard, Mt. Lyell, Mt. Dana, Tower Peak, and other high peaks; n. to Alb., e. to N. Mex. (S. petrophila var. kennedyi Schn.) Not recorded from Mt. Shasta.

17. **S. lemmònii** Bebb. LEMMON'S WILLOW. Stems many from a clustered base forming a rounded shrub 4 to 12 ft. high; leaves lanceolate, acuminate at both ends, entire, green above, very pale glaucous below, glabrous or nearly so, 1 to 4 in. long, 3 to 5 lines broad; petioles 1 or 2 lines long; stipules small, soon deciduous; catkins elliptic, about ½ in. long on very short peduncles with 2 or 3 foliaceous bracts; scales pitch-black, usually rounded, villous; stamens 2, filaments slightly puberulent at base; style short, stigmas short-linear, bifid; fruiting catkins ½ to 1 in. long; ovary and capsule grayish tomentose or the latter glabrate; pedicels in fruit ½ to ¾ line long.—Moist river bottoms and swampy meadows, 5000 to 9000 ft.

common, Sierra Nevada from Tulare Co. to Plumas Co. Var. AUSTINAE Schn. Branchlets with a glaucous bloom.—Plumas Co. (S. austinae Bebb.)

18. **S. gláuca** L. var. **orestèra** Jepson n. comb. Spreading many-stemmed shrub 2 to 4 (or 6) ft. high; leaves oblong-lanceolate, acute or taper-pointed, entire, green above, slightly glaucous beneath, pubescent or subglabrous, when young villous tomentose on both sides, 1 to 2½ in. long, 3 to 7 lines wide; petioles almost none to 3 lines long; stipules lanceolate or none; catkins ½ to ¾ (or 1⅓) in. long, on leafy-bracteate peduncles, the staminate peduncles very short or almost none; scales hairy, dark, turning reddish; ovary hoary-tomentulose; style long; stigmas entire (or 2-lobed); fruiting catkins ¾ to 1½ in. long; capsule brown, finely pubescent, 3 to 4 lines long, pediceled.—High montane slopes, 8000 to 11,500 ft.: Sierra Nevada from Tulare Co. to Sierra Co. (S. orestera Schn. S. glauca var. villosa Bebb, Jepson et al.)

19. **S. commutàta** Bebb. SIERRA WILLOW. Shrub 2 to 5 ft. high; branchlets dark brown; leaves mostly oblong, acute at apex, obtuse at base, appressed-villous and gray (or the young parts densely white tomentose), often glabrescent and green, minutely (or microscopically) glandular serrate or sometimes entire, ¾ to 2½ in. long, 5 to 12 lines broad; margin of small leaves at base of both leafy and flowering shoots thickly studded with glands; stipules ovate, lanceolate or none; catkins on short leafy peduncles, the staminate ½ in., the pistillate ½ to 1 in. long (in fruit 1 to 1½ in. long); scales dark, villous; filaments glabrous; ovary hoary-tomentose, pediceled; style long; stigmas oblong, bifid or entire; capsule brown, finely pubescent, 2 to 3 lines long.—Sierra Nevada, 7000 to 10,500 ft.: House Mdws., North Fork Kings River; Mt. Goddard; Crescent Lake, Mariposa Co.; Peregoy Mdw., Yosemite Park; Tuolumne Soda Sprs.; Summit, Placer Co.; near Mt. Lola; Warner Mts.; also w. Nev.; n. to Alb. and Alas. (S. eastwoodiae Ckl. S. californica Bebb not Lesq.) Var. RUBICÚNDA Jepson n. var. Low shrub ¾ to 1½ ft. high; branchlets cherry-bark red; leaves ovate, glabrate, 6 to 10 lines long (but mature leaves not known); catkins 3 to 5 lines long; capsules glabrous.—High montane, 10,100 to 10,500 ft., in Tulare Co.: Mt. Whitney; Lost Creek; Sawtooth Range (Jepson 4992, type).

20. **S. bréweri** Bebb. BREWER WILLOW. Low spreading shrub 1 to 2 ft. high; mature leaves oblong to linear, shortly acute or obtuse, green and puberulent above, rugose beneath and whitened with a thin but dense felt-like covering, entire, 1 to 2 or 2½ in. long, 3 to 6 lines wide; petioles almost none; stipules of sterile shoots small, ovate, acute; catkins appearing before the leaves, dense, 6 to 9 lines long, 3 to 4 lines thick, sessile, with 2 or 3 small bracts at base; scales yellow, rounded at apex, rather densely pilose on both sides; stamens 2; filaments glabrous; anthers yellow; nectary filiform, very long; ovary and capsule hoary; style elongated, stigmas 2-cleft.—Dry situations, inner Coast Range: Epperson, Colusa Co.; Mt. Hanna; Mt. St. Helena; Mt. Hamilton Range; Hepsedam Peak; San Carlos Range. Var. DELNORTÉNSIS Jepson n. comb. Leaves obovate; anthers violet.—Ne. Del Norte Co. (S. delnortensis Schn.)

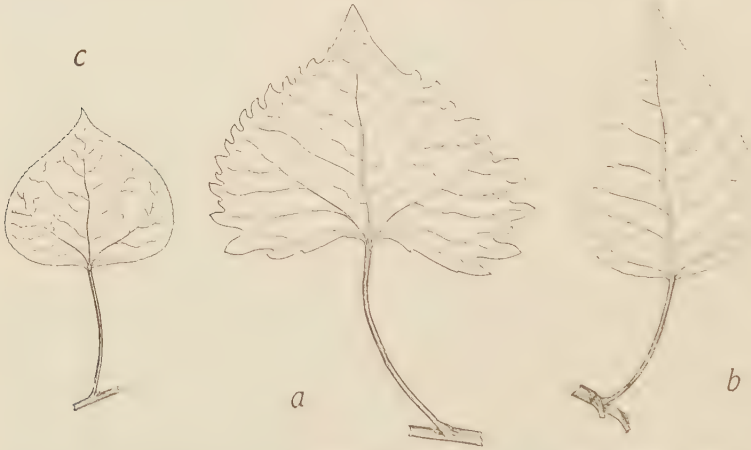
2. PÓPULUS L. Poplar

Trees with scaly buds and caducous stipules. Leaves rather long-petioled, broad. Winter buds covered by many scales. Catkins appearing before the leaves, in ours pendulous; scales fimbriate or lacerate, falling as soon as released by the flowering elongation of the catkin. Stamens inserted on the surface of a concave disk. Ovary seated on a collar-like disk; style short; stigmas 2 to 4, narrow and elongated, or conspicuously dilated. Capsule 2 to 4-valved. Coma of the small seeds long and conspicuous. (Classical Latin name of the Poplar.)

Stamens 40 to 80.
Leaves deltoid-orbicular, broader than long, yellowish green, alike on both faces; valley streams.....1. *P. fremontii.*
Leaves longer than broad, ovate, dark green above, rusty or silvery beneath; valley and mountain streams.....2. *P. trichocarpa.*
Stamens 6 to 12; leaves round-ovate, 1 to 2 in. long; high mountains....3. *P. tremuloides.*

1. **P. fremóntii** Wats. FREMONT COTTONWOOD. Fig. 297a. Handsome tree commonly 40 to 90 ft. high with massive crown, the trunk 1 to 5 ft. in diameter; bark white or whitish, on the main trunk 1 to 5 in. thick, roughly cracked; branchlets stoutish; leaves bright green, lustrous, triangular or roundish in outline, 2 to 4 in. broad, broader than long, the margin crenate except at the abruptly short-pointed apex and the truncate or subcordate base; scales regularly laciniate-fringed, shorter than the flowers; stigmas 3 or 4, roundish; pods ovate, roughish, 4 to 5 lines long, borne on pedicels 2 lines long; disk 1½ to 2 lines broad; seeds copiously provided with long white hairs which soon involve the catkin in a soft cottony mass.—Valleys and foothills, usually along living streams: Great Valley; Sierra Nevada foothills; inner North Coast Ranges but rare; South Coast Ranges; S. Cal.; thence e. to N. Mex. Also called Common Cottonwood. Var. PUBÉSCENS Sarg. Branchlets pubescent.—San Diego and ne. to southern Nev. Var. ARIZÓNICA Jepson n. comb. Branchlets slender; leaves long-pointed.—Mill Creek, San Bernardino Mts. (acc. Sargent); Ariz. (P. arizonica Sarg.). Var. MACDOUGÁLLII Jepson n. comb. Leaves bluish-green; disk 1½ lines broad.—Colorado Desert. (P. macdougallii Rose.)

2. **P. trichocárpa** T. & G. BLACK COTTONWOOD. Fig. 297b. Tree commonly 30 to 125 ft. high, with a broad head of upright branches; trunk 1 to 3 ft.



297. Leaves of Populus; *a*, P. fremontii Wats., x ⅛; *b*, P. trichocarpa T. & G., x ¼; *c*, P. tremuloides Michx., x ½.

in diameter; bark light or dark in color but usually with a yellowish cast, longitudinally fissured, the long, narrow and rather smooth-surfaced plates separated by cleanly channeled fissures; leaves broadly or narrowly ovate, finely serrate, truncate or heart-shaped at base, acute or tapering to a point at apex, 2½ to 7 (or 11) in. long, lustrous green above, rusty-brown beneath when young but at length whitish; stigmas 3, dilated and deeply lobed; pod nearly sessile; seeds with long lustrous white hairs.—Along living streams and rich bottoms in cañons and valleys, mostly 500 to 7500 ft., nearly throughout the state in the greater ranges; w. Nev.; n. to Alas. Var. INGRÀTA Jepson n. comb. Leaves lanceolate, 2 to 4½ in. long, 4 to 10 lines broad.—Santa Ana Cañon, San Bernardino Mts. (f. ingrata Jepson).

3. **P. trémuloides** Michx. ASPEN. Fig. 297c. Slender tree with branches gracefully pendulous towards the ends, 10 to 60 ft. high, the trunk 3 to 10 in. in diameter; bark smooth, greenish white, or on old trunks nearly black; leaves round-ovate, finely toothed or almost entire, abruptly tipped at apex with a short sharp point, 1 to 2 in. long; ovary conical; stigmas 2, very thick below, divided above into 2 slender spreading lobes; seeds minute,

brownish, bearing long white hairs.—Margins of streams or swampy meadows or on rocky drifts, 5000 to 10,000 ft.: Sierra Nevada; not on Mt. Shasta; local in Cañon Creek, Trinity Mts., and Fish Creek Cañon, Mt. San Gorgonio; s. to Mex., e. to Rocky Mts., n. to Brit. Am. It has a more extensive distribution than any other North American tree. The wood burns green.

BETULÀCEAE. Birch Family

Deciduous trees or shrubs with alternate simple petioled leaves and caducous stipules. Flowers monoecious, in catkins, flowering in late winter before the leaves appear. Staminate catkins elongated, pendulous, falling after flowering; flowers 3 in the axil of each scale; calyx present. Pistillate catkins relatively short; calyx none; ovary 2-celled, one ovule in each cell; styles 2. Fruit a 1-celled 1-seeded nutlet.

Scales of the catkin consisting of a bract and 4 bractlets united, in the woody cone obscurely 5-lobed at apex; pistillate catkins developing into oval or ovoid woody cones which are drooping or spreading and eventually fall whole; stamens 2, 3 or 4 (or 1 to 7).....1. ALNUS.

Scales of the catkin consisting of a bract and 2 bractlets united, in the fruiting catkin plainly 3-lobed at apex; pistillate catkins solitary, cylindrical and erect in fruit, falling to pieces when mature; stamens 2.....2. BETULA

1. ÁLNUS Hill. Alder

Catkins 2 to 8 in a cluster, usually borne on a forked peduncle, sometimes sessile. Scales consisting of a bract and 4 bractlets united. Staminate catkins pendulous; calyx 4 (5 or 6)-parted; stamens 1 to 6. Pistillate catkins erect, spike-like, ripening into woody cones, the scales persistent on the axis: flowers 2 in the axil of each scale. Cones spreading or pendulous when mature. Nutlet with a narrow acute margin. (The Latin name.)

Catkins appearing in the early autumn as rather conspicuous naked buds and flowering in the late winter or early spring before the leaves appear; peduncles of the pistillate catkins naked, their branches ½ in. long or less; stamens 1 to 4.

Trees 30 to 80 ft. high; mostly of low altitudes.

Leaf-margin plane, with small scattered glandular teeth; bracts of staminate catkin obtuse; stamens 2, sometimes 3, 1, or 4.....1. *A. rhombifolia.*

Leaf-margin coarsely toothed, the entire margin with a narrow underturned edge; bracts of staminate catkin acute or acutish; stamens 4, rarely 3.....2. *A. rubra.*

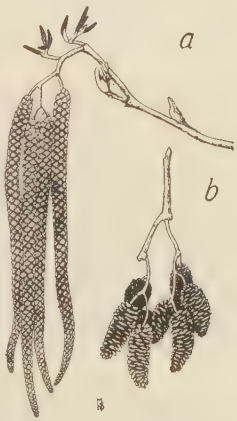
Shrubs 8 to 15 ft. high; leaf-margin coarsely toothed and again finely toothed; stamens 4 or 2; high montane.....3. *A. tenuifolia.*

Catkins appearing in the spring from scaly buds at the same time as the leaves; peduncles of the pistillate catkins leafy (at least at base), their branches ½ to 1 in. long; stamens 5 or 6; leaf-margin sharply or laciniately toothed; high montane shrub..4. *A. viridis.*

1. **A. rhombifòlia** Nutt. White Alder. Tree 30 to 115 ft. high; bark whitish or gray-brown; leaves oblong-ovate or -rhombic, tapering more or less to base and apex, 2 to 4 in. long; cones ovoid, 5 to 9 lines long.—Banks of rivers and living streams: Coastal S. Cal.; Sierra Nevada cañons; Great Valley; Coast Ranges except in the narrow coast strip occupied by Red Alder; n. to Wash.

2. **A. rùbra** Bong. Red Alder. Fig. 298. Tree 30 to 90 ft. high; bark very white or white-mottled; leaves 2 to 6 in. long, elliptic ovate, often rusty beneath, the coarse teeth again finely toothed; cones oblong-ovoid, ¾ to 1⅛ in. long.—Deep cool cañons or moist flats along the coast: Santa Inez Mts. to Del Norte Co.; n. to Alas. Abundant from Marin Co. to Humboldt Co., where it forms pure groves of singular beauty in marshy bottoms near the sea. Also called Oregon Alder.

3. **A. tenuifòlia** Nutt. Mountain Alder. Shrub or small tree, 8 to 14 ft. high; leaves roundish to ovate, thickish, at base truncately rounded (or even subcordate) to cuneate, coarsely toothed and again finely serrate, 1 to 3 in. long; staminate catkins 3 or



298. Alnus rubra Bong.; *a*, fl. branchlet; *b*, cluster of winter "cones." x ¼.

4 in a cluster, 3 in. long; pistillate catkins 3 to 8 in a cluster, sessile or with peduncles almost 2 lines long; cones small, 3 to 7 lines long.—Thickets on wet hillsides or in moist hollows, 5000 to 7000 ft.: Sierra Nevada from Lake Tahoe to Mt. Shasta, thence w. to Trinity Summit and the Siskiyous; n. to Yukon Terr., e. to Rocky Mts.; also in L. Cal.

4. **A. víridis** DC. var. **sinuàta** Regel. THIN-LEAF ALDER. Slender shrub 6 to 10 ft. high; leaves broadly ovate, thin, gummy when young, bright green, unequally and sharply or laciniately toothed, 2¼ to 3 in. long; catkins appearing in spring at the same time as the leaves, the peduncles of the pistillate leafy at base, their branches ½ to 1 in. long; stamens exceeding the sepals, the filaments long.—High montane, 6500 to 7000 ft.: Trinity Summit to Mt. Shasta; n. to Alas.; Siberia.

2. BÉTULA L. BIRCH

Scales of the catkins consisting of a bract and 2 bractlets united. Flowers 3 in each axil or sometimes 2 in the pistillate catkin. Staminate catkins 1 to 3 in a cluster, sessile or short-peduncled, pendulous; calyx 4 (or 2)-lobed; stamens 2, each filament with 2 distinct anther-cells. Pistillate catkins solitary on the peduncle and erect. Cones erect, long and slender, the scales falling away from the axis (on the tree) when the fruit is mature. Nutlet seed-like, with a broad thin wing. (Latin name of the birch.)

Leaves 1 to 2 in. long; lobes of bracts broad, usually parallel, acutish.....1. *B. fontinalis.*
Leaves ½ to 1 in. long; lobes of bracts narrow, divergent, obtusish.....2. *B. glandulosa.*

1. **B. fontinàlis** Sarg. WATER BIRCH. Slender tree 10 to 25 ft. high with red-brown smooth bark; leaves round-ovate, sharply serrate, mostly acute at apex, almost or quite glabrous, 1 to 2 in. long; petioles 4 to 5 lines long; staminate catkins 2 to 2½ in. long; pistillate catkins 1½ in. long in fruit, 3 or 4 lines in diameter.—Cañon streams, 2500 to 8000 ft., Sierra Nevada from Bubbs Creek and Inyo Co. to Mt. Shasta, thence w. to Humboldt Co.: n. to B. C. (B. occidentalis Jepson.) Var. INOPÌNA Jepson n. comb. Branchlets rather densely hairy; fruiting catkins 1 in. long.—Sw. Siskiyou Co. (B. occidentalis f. inopina Jepson.).

2. **B. glandulòsa** Michx. SCRUB BIRCH. Shrub 1 to 4 ft. high with glandular-warty twigs; leaves roundish, serrate except at base, ½ to 1 in. long; staminate catkins commonly solitary; pistillate catkins 4 to 9 lines long.—High montane, Lassen and Modoc Cos.; n. to arctic circle.

CORYLÀCEAE. HAZEL FAMILY

Shrubs or bushes with alternate simple leaves. Staminate catkins pendent, worm-like, from scaly buds; staminate flowers solitary in the axil of each scale, without perianth; stamens (in ours) seemingly 8, really 4, each anther cell and its stalk representing the half of a forked filament. Pistillate catkins reduced to small clusters set in scaly buds; pistillate flowers 2 to each scale, each flower with 2 minute laciniate-fringed bractlets; perianth minute, adnate to the 2-celled ovary and without limb; style short; stigmas slender, elongated. Bractlets in fruit much enlarged, forming a foliaceous involucre about the nut.

1. CÓRYLUS L. HAZEL

Leaves broad, thin, serrulate or incised. Flowers appearing before the leaves. Involucre tubular. (Ancient Greek name.)

299. Corylus rostrata var. californica A. DC.; fr. branchlet x ½.

1. **C. rostràta** Ait. var. **californica** A. DC. California Hazel. Fig. 299. Commonly 6 to 10 (rarely 20) ft. high; leaves obovate to roundish, rounded at apex or shortly acute, sometimes obscurely 3-lobed above the middle, short-villous beneath (velvety to the touch), 1½ to 4 in. long; involucre at base sometimes densely, sometimes sparingly hispid or almost glabrous, prolonged beyond the nut into a laciniately fringed tube ½ to 1¼ in. long; nut ovoid, bony, 6 lines long.—Along streams in cool cañons or on moist slopes: Coast Ranges, 20 to 2500 ft., from the Santa Cruz Mts. and Napa Co. to Humboldt Co. and Del Norte Co.; Sierra Nevada, 2500 to 6000 ft. from the Kaweah River to Yosemite and Mt. Shasta; n. to B. C. Not as yet seen in Vaca Mts., inner South Coast Range or Santa Lucia Mts. (C. californica Rose.) Var. TRÀCYI Jepson n. var. Leaves subglabrous beneath or sparingly pubescent (not velvety); involucral tube (beyond nut) very short, 2 to 4 (rarely 8) lines long.—Humboldt Co. (Grouse Mt., Tracy 4842, type) to Siskiyou Co. and s. in the Sierra Nevada.

FAGÀCEAE. Oak Family

Trees or shrubs with alternate simple leaves and promptly deciduous stipules. Flowers monoecious, apetalous, appearing with the leaves in the deciduous kinds. Staminate flowers in catkins; calyx parted into several lobes; stamens 4 to 12. Pistillate flowers 1 to 3 in an involucre of imbricated scales, the involucres solitary or few in extremely reduced or short catkins or sometimes 1 or 2 at base of staminate catkins; ovary adherent to the calyx, 3-celled, 6-ovuled, only one ovule maturing, the remaining ovules and the other two cells abortive. Fruit a nut borne singly in a scaly cup or 1 to 3 in a spiny bur.

Fruit an acorn; catkins simple.
Catkins unisexual, the staminate drooping.....1. QUERCUS.
Catkins erect, all with staminate flowers, pistillate flowers at base of some of them...
2. LITHOCARPUS.
Fruit a spiny bur; catkins erect, often branching, unisexual, or with pistillate flowers at base of some of the staminate catkins.....3. CASTANOPSIS.

1. QUÉRCUS L. Oak

Trees or shrubs of slow growth, hard wood and usually contorted branches. Flowers greenish or yellowish. Staminate catkins pendulous, one or several from the lowest axils of the season's shoot. Pistillate flowers borne in the upper axils of the season's shoot, the ovary with 3 to 5 styles or stigmas. Fruit an acorn, the nut set in a scaly cup. Abortive ovules often discernible in the ripe or nearly ripe acorn. (Latin name of the oak.)

A. White Oaks.—Bark commonly white or whitish, wood light-colored; stamens mostly 6 to 9; stigmas sessile or nearly so; abortive ovules mostly towards base of nut.

1. Acorns maturing the first autumn; nut glabrous on the inner surface.

Deciduous species.
Branchlets pendulous; acorn cups deep, the nut long and slender; leaves pinnately parted with coarsely 2 to 3-toothed lobes; trunk bark dark brown, deeply cuboid-checked; valleys.....1. *Q. lobata.*
Branchlets not pendulous; acorn cups shallow; trunk bark white, shallowly checked but smoothish.
Leaves dark lustrous green above, rusty or pale beneath, 5 to 7-parted; nut subglobose or oblong-cylindric; mossy trees; mainly North Coast Ranges..
2. *Q. garryana.*
Leaves bluish green above, pale beneath, oblong, coarsely toothed or entire; nut oval, often swollen at or below middle; interior dry foothills.....
3. *Q. douglasii.*

Evergreen species.
Small tree; leaves blue-green, oblong, mainly entire; nut subcylindric; S. Cal.....
4. *Q. engelmannii.*
Shrubs; cups saucer-shaped.
Branches rigid; leaves ¾ to 1 in. long; chaparral areas.
Leaves brittle, plane, light green, oblong, spiny-dentate or entire; nuts oval to cylindric, blunt or pointed.....5. *Q. dumosa.*
Leaves tougher, dark green, convex above, regularly dentate; nuts short cylindric or subglobose, very obtuse.....6. *Q. durata.*
Branches slender, pliable; leaves 3 to 4½ in. long, strongly parallel-nerved, toothed, chestnut-like; local in Siskiyous and vicinity..7. *Q. sadleriana.*

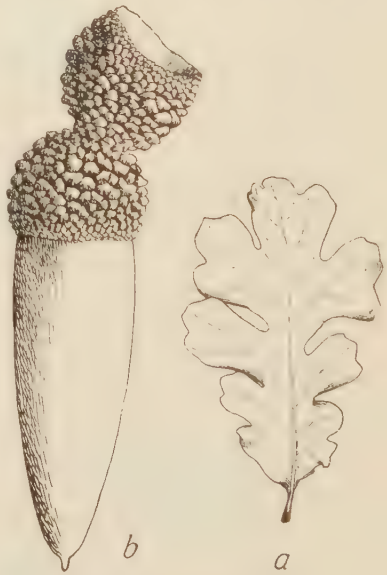
2. Acorns maturing the second autumn; nut tomentose or hairy within.

Trees; acorn cup usually very large and thick.
Leaves 2 to 3½ in. long, dense woolly when young, with prominent regular parallel nerves; islands off south coast.....8. *Q. tomentella.*
Leaves commonly 1 to 2 in. long, entire or spinose-toothed, dull green above, lead-color beneath or with a golden fuzz when young; cup typically like a yellow turban; mts.....9. *Q. chrysolepis.*
Shrubs; acorn cup sub-turbinate or low bowl-shaped, thin; leaves ½ to 1½ in. long.
Branches slender and pliable, forming broom-like tufts at top of stems; leaves mostly entire, no golden fuzz; high montane.....10. *Q. vaccinifolia.*
Branches rigid, spreading; leaves dentate-prickly, clivaceous above, pale beneath; S. and L. Cal.....11. *Q. palmeri.*

B. Black Oaks.—Bark dark or black, wood dark or reddish; stamens 4 to 6; stigmas on long styles; abortive ovules mostly towards top of nut; nut tomentose within.

Acorns maturing the first autumn; nut slender-ovate; leaves roundish or elliptic, convex above; coast valleys and hills.....12. *Q. agrifolia.*
Acorns maturing the second autumn.
Leaves oblong, obtuse or tapering to the acute apex, plane, pale yellowish below; nut slender ovate, often streaked longitudinally; interior valleys and hills.....
13. *Q. wislizenii.*
Leaves pinnately parted or toothed, always bristle-tipped; nut oblong, obtuse; mts.
Deciduous tree; leaf divisions generally coarsely toothed; common.....
14. *Q. kelloggii.*
Semi-evergreen tree; leaf divisions smaller, generally entire; rare.....
15. *Q. morehus.*

1. **Q. lobàta** Neé. VALLEY OAK. Fig. 300. Graceful tree, commonly 40 to 125 ft. tall; trunk 2 to 10 ft. in diameter; bark thick, cuboid-checked; leaves 3 to 4 (rarely 6) in. long, 2 to 3 in. broad, green above, paler beneath, yellow-veined, parted to the middle or nearly to the midrib into 3 to 5 pairs of lobes; lobes most commonly broadened towards the end, less frequently pointed, coarsely 2 or 3-toothed at apex or sometimes entire; cup drab-brown, deeply hemispherical, very warty, ½ to ¾ in. deep; nut long conical, at first bright green, later mahogany or chestnut-brown, 1½ to 2¼ in. long, ½ to ¾ in. in diameter.—Rich soils of the Sacramento and San Joaquin valleys, Sierra foothills and Coast Range valleys, but not in valleys facing the sea; s. to San Fernando Valley. The most characteristic tree of well-watered valley floors, the round-topped crown typically broader than high, its spreading branches finally ending in long cord-like branchlets which sometimes sweep the ground (whence "Weeping Oak"). Called Water Oak, White Oak and Mush Oak by settlers and Roble by the Spanish-Californians. Var. WÁLTERI Jepson. Leaves roundish in outline, sinuses very narrow; nuts very thick.—Kaweah River basin, 2700 to 4000 ft. Var. TURBINÀTA Jepson. Leaves large and thicker than in the species; nuts turbinate.—Little Lake Valley, Mendocino Co. Var. ARGILLÀRUM Jepson n. comb. Pendulous branchlets mostly none; bark smoother, often whitish; leaves deeply and narrowly lobed, often persistent through the winter.—Clay hills, w. Solano Co. (f. argillarum Jepson). Var. INSPERÀTA Jepson n. comb. Leaves narrow (¾ to 1¼ in. wide); cups shallow, strongly tuberculate; nuts smaller than in the species.—Kaweah River foothills. (f. insperata Jepson).



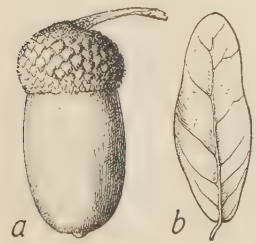
300. Quercus lobata Neé; *a*, leaf x ½; *b*, acorn x 1.

301. Quercus garryana Dougl.; *a*, leaf x ½; *b*, acorn x 1.

2. **Q. garryàna** Dougl. OREGON OAK. Fig. 301. Round-headed tree 25 to 55 ft. high, the trunk bark white, thin, superficially checked into small squarish scales; leaves 3 to 4 (or 6) in. long, 1½ to 4½ in. wide, dark lustrous green and nearly glabrous above, rusty or pale, finely pubescent and yellow-veined beneath, leathery in texture and pinnately parted into 5 to 7 (rarely 9) lobes with mostly deep and often acute sinuses; lobes entire or with 2 or 3 coarse rounded unequal teeth; cup very shallow, 6 to 9 lines broad, with tuberculate scales; nut bulging beyond the small cup, typically subglobose but varying to obovoid or subcylindric, although always rounded at apex, ¾ to 1 in. long, ⅔ to ¾ in. thick, its surface polished and shining.—Rich mt. slopes: Santa Cruz Mts. and Mt. Tamalpais to Mendocino and Humboldt Cos.; far n. to B. C. Wood used for shipbuilding and interior finish in Oregon. Also called Garry Oak and Post Oak. Var. BRÈWERI Jepson. Brewer Oak. Scrub form; leaves 1 to 2 in. long.—High altitudes from the Yollo Bolly Mts. to the Siskiyou Mts. Var. SEMÒTA Jepson. Kaweah Oak. Shrub; leaves 3 to 4 in. long.—Chaparral belt of the s. Sierra Nevada.

302. Quercus douglasii H. & A.; *a*, *b*, leaves x ½; *c*, acorn x 1.

3. **Q. douglásii** H. & A. BLUE OAK. Fig. 302. Tree 20 to 60 ft. high, the white trunk bark shallowly checked into small thin scales, this characteristic roughness extending well out to the smaller branches; leaves minutely pubescent, bluish green above, pale beneath, 1 to 3 in. long, ½ to 3 in. wide, mostly oblong to obovate, entire, or coarsely and often unequally few-toothed, or shallowly lobed; cup 4 to 6 lines broad, of less diameter than the nut and very shallow, the scales developing small wart-like processes; nut ¾ to 1½ in. long, 6 to 10 lines thick, dark or light brown, oval in outline but variable, often much swollen just below or at the middle or only on one side, or again narrow and tapering to apex.—Dry or rocky foothills, common, forming open stands: Sierra Nevada foothills; inner Coast Ranges; approaching the ocean only in Monterey Co., where the Redwood Belt is narrowest. Often called Mountain Oak and Iron Oak by settlers.



303. Quercus engelmannii Greene; *a*, acorn x 1; *b*, leaf x ½.

4. **Q. engelmánnii** Greene. MESA OAK. Fig. 303. Spreading or round-crowned tree 15 to 50 ft. high with trunk ½ to 3 ft. in diameter; leaves blue-green, oblong, obtuse, entire or sometimes toothed, ¾ to 3 (most commonly 1¼ to 1¾) in. long, ⅝ to 1 in. wide; acorns ripe in first autumn; cup ¾ in. broad, shallow or sometimes bowl-shaped, with warty scales, inclosing nearly ½ the nut which is subcylindrical, ½ in. long and about as thick, or 1 in. long, relatively less thick and sometimes acute.—Coastal S. Cal.: foothills of the San Gabriel Mts. near Pasadena; mts. of San Diego Co. in a zone about 15 to 40 miles back of the sea; s. to L. Cal.

5. **Q. dumòsa** Nutt. SCRUB OAK. Fig. 304. Shrub 2 to 8 ft. high, with tough rigid branches and branchlets; leaves typically oblong to elliptic or roundish, entire or more commonly irregularly spinose-serrate, or sinuate-lobed with sharply cut or angular sinuses, ¾ to 1 in. long; cup shallowly or deeply saucer-shaped to turbinate, 5 to 8 lines broad, 2 to 5 lines deep, often rusty, the scales tuberculate, sometimes so regularly as to suggest a quilted cushion; nut oval to cylindric, rounded or pointed at apex, ¾ to 1⅛ in. long.—Common chaparral shrub in the mts. of S. Cal., ranging northw. through both the Coast Ranges and Sierra Nevada, more or less abundant in the middle and southerly parts of those ranges, rarer in the north. It is highly variable in leaf texture and outline and in acorn character, both of cup and nut. Var. TURBINÉLLA Jepson. Grey Oak. Leaves pale, brittle; cups small, turbinate; nuts slender, pointed.—San Carlos Range, s. to L. Cal. Var. ALVORDIÀNA Jepson. Leaves similar to var. turbinella; nuts slender, very long (1⅝ in.).—Inner South Coast Range from the San Carlos Range to the San Emigdio Mts. Var. ELEGÀNTULA Jepson n. comb. Shrub 10 to 15 ft. high; leaves narrow, regularly and mostly sharply toothed from base to apex, but variable.—S. Cal. (Monrovia; Fallbrook). (Q. macdonaldii var. elegantula Greene.) Var. MACDONÁLDII Jepson n. comb. Small tree 15 to 35 (or 50) ft. high; leaves oblong to spatulate-oblong, 1¼ to 2¾ in. long, sharply but not deeply lobed and mostly above the base.—Santa Cruz Isl.; Santa Catalina Isl. (Q. macdonaldii Greene.)

304. Quercus dumosa Nutt.; *a*, acorn; *b*, leaf. x 1.

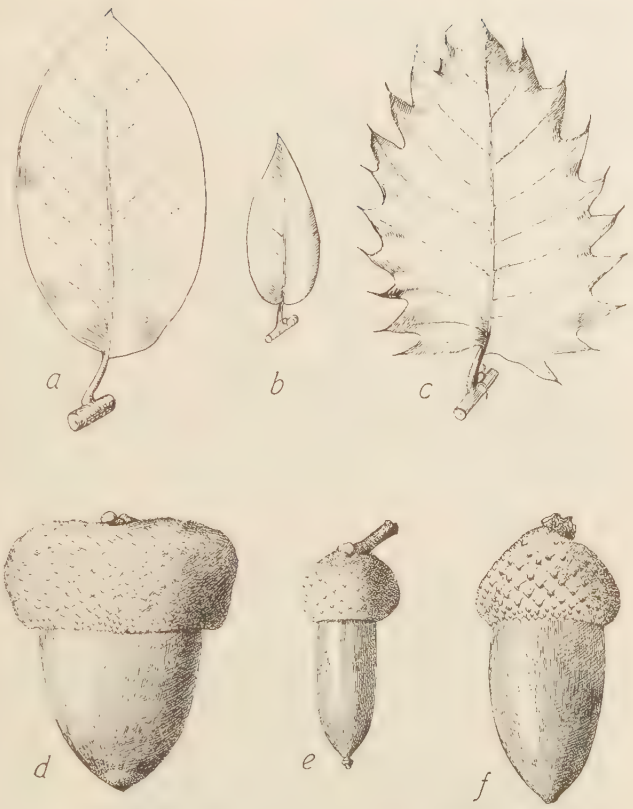
6. **Q. duràta** Jepson. LEATHER OAK. Low spreading shrub with rigid branches, 2 to 5 ft. high; younger branches and leaves densely tomentose; leaves oval, dentate with prickly equal teeth, above convex, the margin more or less revolute; cup bowl-shaped, 8 to 9 lines broad, 4 to 5 lines high, the scales tuberculate; nut short, thick, cylindric, rounded at apex, 7 to 9 lines long.—Monterey Co. to Napa Co.

7. **Q. sadleriàna** R. Br. Campst. DEER OAK. Shrub mostly 2 or 3 but even 8 ft. high with several stems from the base; leaves persistent through the winter and until after the new leaves appear in the next summer, oblong-ovate, 3 to 4½ in. long, the lateral nerves prominent, regular and parallel; stipules oblanceolate, ½ to ¾ in. long, fur-like on account of their dense covering of rusty hairs and persisting as long or even longer than the leaves; acorns ripe in first autumn; cup inclosing about ⅓ of the nut which is oval and about ¾ in. long.—High montane, 5000 to 7000 ft.: Trinity Summit to the Siskiyou Mts.; sw. Ore. Most restricted in range of any Californian oak.

8. **Q. tomentélla** Engelm. ISLAND OAK. Round-headed tree 25 to 40 ft. high; leaves elliptic to oblong, tomentose or glabrate and light green above in age, strongly parallel-nerved beneath, 2 to 3½ in. long; cup 1 to 1½ in. wide, ½ to ¾ in. deep, its scales imbedded in a dense tomentum but the tips free; nut subglobose, bluntish, 1 in. long.—Santa Cruz, Santa Rosa, Santa Catalina and San Clemente islands of the Santa Barbara group; also Guadaloupe Isl. It is a strictly insular species.

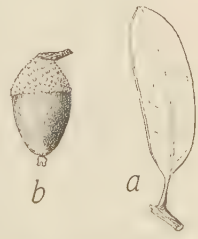
9. **Q. chrysólepis** Liebm. MAUL OAK. CAÑON OAK. Fig. 305a, c, d. Tree 20 to 60 ft. high with roundish or often spreading crown; trunk bark whitish,

rather smooth; leaves 1 to 2 (sometimes even 4) in. long, thick, green above, yellow beneath with a fine fuzz or powder, or eventually lead-color or dull white, ovate or oblong - ovate, acute at apex, entire, or with entire and toothed leaves frequently found on the same twig; typical cup thick and round-edged with a fine fuzzy or felt-like tomentum concealing the scales, the whole suggesting a yellow turban; nut ovate, globose, or cylindric, rounded at apex or sharply pointed, 1 to 1¼ in. long, ¾ to 1 in. thick. — Mountain ridges, slopes and cañons almost throughout Cal., extremely variable in habit and in the acorns. It has a wider distribution and grows under more varied conditions than any other species of this family in Cal., but does not occur in the foothills. Called also Goldcup Oak, Mountain Live Oak, White Live Oak, Pin Oak and Hickory Oak. It furnishes the most valuable wood amongst our species, being strong, tough and close-grained. Var. NÀNA Jepson n. comb. Fig. 305b. Leaves ovate, acute, small (¾ to 1½ in. long).—Scrub form in the chaparral. (f. nana Jepson.) Var. HANSÈNII Jepson n. comb. Fig. 305e. Low tree; nut slender-cylindric.—Amador Co. (f. hansenii Jepson.) Var. GRÁNDIS Jepson n. comb. Fig. 305f. Tree 60 to 110 ft., high, usually with very tall trunks; cup rather thin, the pubescence thin, not concealing the scales.—Deep cañons, Mendocino Co. (f. grandis Jepson.) Var. PÉNDULA Jepson n. comb. Branchlets pendulous; leaves oblong- to broad-lanceolate, deep shining green above.—Upper San Benito River. (f. pendula Jepson.)



305. Quercus chrysolepis Liebm.; *a*, *c*, typical leaves; *d*, acorn; *b*, var. nana Jepson, leaf; *e*, var. hansenii Jepson, acorn; *f*, var. grandis Jepson, acorn. x 1.

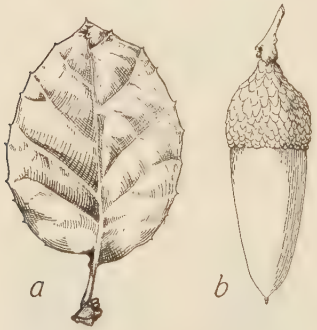
10. **Q. vaccinifòlia** Engelm. HUCKLEBERRY OAK. Fig. 306. Low evergreen shrub; branches slender and pliable, forming broom-like tufts at top of stems; leaves very small, mostly entire, no golden fuzz; acorn-cup thin; nut globose-ovate, 4 to 6 lines long.—High montane, 5000 to



306. Quercus vaccinifolia Engelm.; *a*, leaf; *b*, acorn. x 1.

10,000 ft., often gregarious: Sierra Nevada; Trinity Mts. to the Siskiyou Mts.

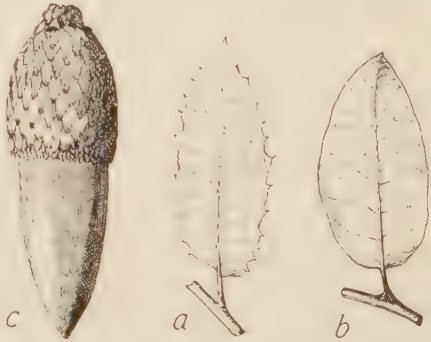
11. **Q. pálmeri** Engelm. PALMER OAK. Rigidly branched shrub 5 to 15 ft. high; leaves typically elliptic to roundish ovate or nearly orbicular, wavy-spinose, ½ to 1½ in. long, undulate, coriaceous and stiff, olivaceous above, pale or whitish beneath; young leaves sparingly pubescent on the upper surface and with a dense but thin yellowish or later white felt on the lower surface; cup thinnish, subturbinate but shallow, 5 to 7 lines broad, 3 to 5 lines deep; nut ovate, ¾ to 1 in. long, the shell tomentose within; seed-leaves purple, separable.—Mts. of S. Cal. from the Santa Rosa Mts. to Jacumba; s. to L. Cal.



307. Quercus agrifolia Neé; *a*, leaf; *b*, acorn. x 1.

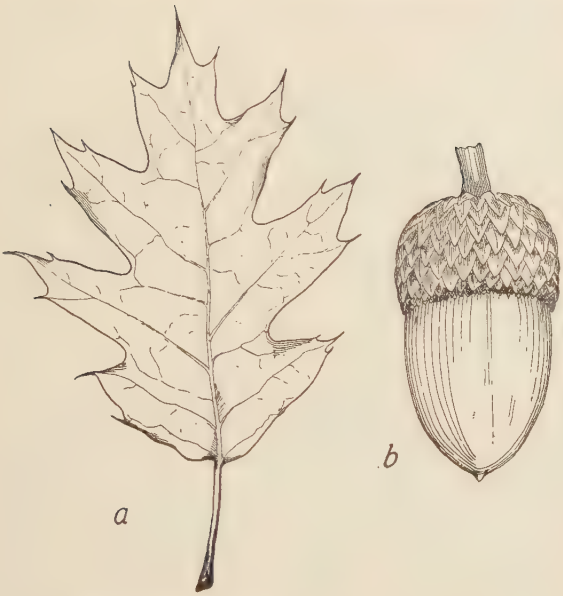
12. **Q. agrifòlia** Neé. COAST LIVE OAK. Fig. 307. Low broad-headed tree 20 to 70 ft. high; trunk bark smooth and beech-like or irregularly fissured; leaves roundish, elliptic, sometimes ovate or oblong, usually with spine-tipped teeth or sometimes entire, commonly 1 or 2 in. long but varying from ½ to 4 in., usually convex above; cup broadly turbinate, 4 to 7 lines deep, usually embracing only the base of the nut; nut slender, pointed, 1 to 1½ in. long, 5 to 7 lines thick.—Abundant on rich valley floors, rocky hills and steep cañon sides from cismontane S. Cal. through the Coast Ranges as far north as Mt. Diablo and Napa and Sonoma Cos. Also L. Cal. Var. FRUTÉSCENS Engelm. Scrub form in the chaparral, 3 to 6 ft. high.—Berkeley Hills and elsewhere.

13. **Q. wislizènii** A. DC. INTERIOR LIVE OAK. Fig. 308. Round-headed tree most commonly 30 to 75 ft. high; trunk 1 to 3 ft. in diameter with a thick brittle bark which is very smooth or sometimes roughly fissured; leaves typically oblong (varying to elliptic, ovate or ovate-lanceolate), either tapering to apex or rounded, 1 to 2½ (or 4⅝) in. long, glabrous, green and shining above, pale yellowish green below, the margin entire or spiny-toothed; cup deeply cup-shaped to hemispherical, embracing ¼ to ½ the nut, 6 to 7 lines broad, its scales thin, red-brown; nut cylindric and tapering to the apex or conical, often longitudinally banded with dark lines converging at the summit, 1¼ to 1⅝ in. long.—Hill slopes or moist valley levels, 200 to 5000 ft.: Great Valley; Sierra Nevada foothills from Kern Co. to Shasta Co., thence s. in the inner Coast Ranges to the Vaca Mts. and to Ukiah Valley. Var. FRUTÉSCENS Engelm. Scrub form in the chaparral usually 4 to 6 ft. high; branchlets very rigid; leaves small, thick.—Coast Range summits and ridges w. to the ocean and s. to S. Cal. and L. Cal. Var. EXTÍMA Jepson n. comb. Acorns very small, the nut 8 to 9 lines long, 3 lines thick.—Kaweah River, 4000 ft. (f. extima Jepson.)



308. Quercus wislizenii A. DC.; *a*, *b*, leaves; *c*, acorn. x 1.

14. **Q. kellóggii** Newb. CALIFORNIA BLACK OAK. Fig. 309. Graceful tree with broad rounded crown, 30 to 80 ft. high; trunk bark dark, checked into small plates; leaves deeply and mostly sinuately parted, with about 3 lobes on each side ending in 1 to 3 or more coarse bristle-tipped teeth, lustrous



309. Quercus kelloggii Newb.; *a*, leaf x ½; *b*, acorn x 1.

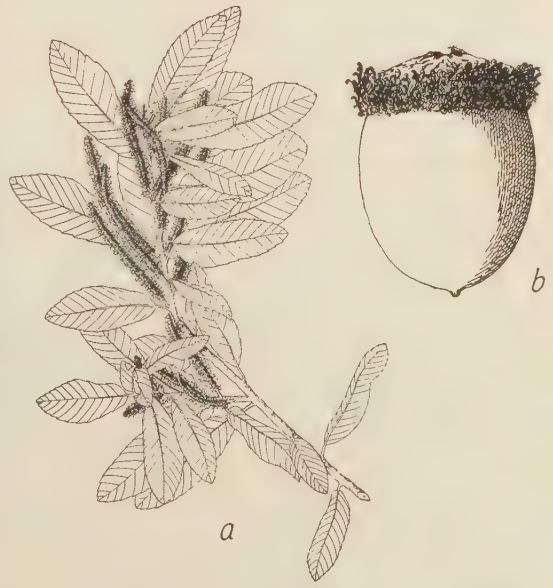
green above, lighter beneath, often white with a fine tomentum when young, 4 to 10 in. long, 2½ to 6 in. wide; cup large, ½ to 1 in. deep, ¾ to 1⅛ in. broad, its scales thin, with a membranous and sometimes ragged margin; nut oblong, rounded at apex, deeply set in the cup, 1 to 1¼ in. long and ¾ in. thick, covered at first with a fine fuzz. — Mountain slopes and gravelly valleys, 1500 to 6500 ft., or sometimes ascending to 8000 ft. or descending to 200 ft.: high mts. of S. Cal.; Sierra Nevada; Coast Ranges, but not near the sea; n. to southwestern Ore.

15. **Q. mórehus** Kell. ORACLE OAK. Tree 25 to 50 ft. high; leaves oblong to elliptic, 2½ to 4 in. long, sinuately but rather shallowly lobed, the lobes pointing upward and spinose-tipped; cups similar to those of Q. wislizenii or more cup-shaped; nuts cylindric, about 1 in. long, 6 to 7 lines thick, minutely pubescent.—Occurring only at scattered stations, the individuals usually few, 200 to about 5000 ft.: Sierra Nevada from Eldorado to Tulare Co.; Coast Ranges from Trinity Co. to Alameda Co.; San Bernardino Mts.

2. LITHOCÁRPUS Bl.

TAN OAK

Trees or shrubs with evergreen leaves and erect catkins. Staminate flowers one in a place, densely disposed in elongated simple erect catkins; stamens 8 to 10, four times as long as the 5-parted calyx. Pistillate flowers 1 in an involucre the involucres few at the base of some of the staminate catkins;



310. Lithocarpus densiflora Rehd.; *a*, fl. branchlet x ¼; *b*, acorn x 1.

calyx often with rudimentary stamens; ovary 3-celled. Fruit an acorn, the cup with slender spreading scales. (Greek lithos, rock, and karpos, fruit, referring to the acorn.)

1. **L. densiflòra** (H. & A.) Rehd. TAN OAK. Fig. 310. Large tree 50 to 150 ft. high; leaves oblong, acute, strongly parallel-nerved beneath, the nerves ending in the teeth of the margin, 2½ to 4½ in. long, 1 to 1¾ in. wide; catkins slender, 2 to 4 in. long; acorns ripe in second autumn; cup ¾ to 1¼ in. broad; nut globose or short thick cylindric, 1 to 1½ in. long, covered with a deciduous close woolly coat.—Fertile mt. slopes and ridges, Santa Ynez Mts. to Siskiyou Co., thence s. to Mariposa Co. It is associated with the Redwood, or in Mendocino and Humboldt Cos. it becomes most highly developed in the "Bald Hills" country just inside the Redwood Belt. (Pasania densiflora H. & A.) Var ECHÌNOÌDES Abrams. Scrub Tan Oak. Low shrub 1 to 10 ft. high, its thick leaves 1 to 2 in. long, entire, and with inconspicuous nerves.—Siskiyou region.

3. CASTANÓPSIS Spach. CHINQUAPIN

Trees or shrubs with evergreen leaves and branchlets lengthening by a terminal bud. Catkins slender, erect. Staminate flowers in clusters of 3, disposed on elongated sometimes branching catkins; calyx 5 or 6-parted; stamens 6 to 12; ovary rudiment present. Pistillate flowers 1 to 3 in an involucre, the involucres on shorter catkins or sometimes scattered at the base of the staminate catkins; calyx 6-cleft with abortive stamens on its lobes; ovary 3-celled with 2 ovules in each cell; styles 3. Fruit maturing in the second season, the spiny involucre inclosing 1 to 3 nuts. Nuts ovoid or globose, more or less angled, usually 1-seeded. (Greek kastanea, chestnut, and opis, resemblance.)

Tree with thick rough bark, less commonly a shrub; leaves 2½ to 5½ in. long, usually long-pointed ..... 1. *C. chrysophylla.*
Shrub, low and spreading, with thin bark; leaves 1½ to 3 in. long, usually obtuse ..... 2. *C. sempervirens.*

1. **C. chrysophýlla** A. DC. GIANT CHINQUAPIN. Tree 50 to 115 ft. high with the very thick trunk bark broken into longitudinal furrows; leaves oblong, tapering to base and also to apex (commonly abruptly long-pointed), entire, dark green on the upper surface, at first golden with a fine tomentum below, later light olive-yellow, 2½ to 5½ in. long, ¾ to 1¾ in. wide, the nerves straightish, forking well inside the margins; burs chestnut-like, irregularly 4-valved, containing 1 or sometimes 2 subtriangular nuts 4 or 5 lines long with hard shell and sweet kernel. —Mendocino and Humboldt Cos.; n. to Ore. Var. MÌNOR Benth. Golden Chinquapin. Fig. 311. Shrub 3 to 15 ft. high; leaves trough-like (partly folded along the midrib), very golden below, 2 to 3 in. long. — Rocky ridges and slopes: Monterey to Humboldt Co., mostly near the coast.

311. Castanopsis chrysophylla var. minor Benth.; fl. branchlet x ½.

2. **C. sémpervìrens** Dudley. BUSH CHINQUAPIN. Spreading shrub 1 to 8 ft. high with smooth brown bark; leaves mostly plane, oblong, acutish at base, acute or obtuse at apex, or sometimes tapering

upwards from near the base and therefore lanceolate-oblong, 1½ to 3 in. long and 5 to 11 lines wide.—Dry mt. slopes or rocky ridges; high mts. of S. Cal. and Sierra Nevada, 3000 to 8000 ft.; Coast Ranges, 1500 to 4000 ft., but not near the sea.

JUGLANDÀCEAE. Walnut Family

Deciduous trees with pinnately compound leaves without stipules. Flowers monoecious, appearing after the leaves. Staminate flowers numerous in pendulous lateral catkins. Pistillate flowers few on short erect terminal catkins. Ovary 1 to 3-celled, inferior. Fruit a nut with a dry husk; seed one, deeply 2-lobed.

1. JÙGLANS L. Walnut

Bark strong-scented. Branchlets hollow, divided into little chambers by pithy partitions. Buds nearly naked. Staminate flower with an irregularly 3 to 6-lobed calyx and numerous stamens. Pistillate flower with a 4-lobed calyx. Seed so lobed as to fit the irregularities of the nut. (Latin Jovis, Jupiter, and glans, nut.)

Leaflets lanceolate; fruits 1½ to 1¾ in. in diameter, the nuts smoothish....1. *J. hindsii.*
Leaflets oblong-ovate to oblong-lanceolate; fruits ¾ to 1 (or 1¼) in. in diameter, the nuts with longitudinal channels.....2. *J. californica.*

1. **J. hìndsii** Jepson. California Black Walnut. Tree 30 to 60 ft. high with erect unbranched trunk 10 to 40 ft. high; crown usually as high as broad; leaflets (2½ or) 3 to 5 in. long.—Central California, on old Indian camp-sites: Walnut Creek; Walnut Grove; Napa Range above Wooden Valley; Gordon Valley.

2. **J. califòrnica** Wats. Southern California Black Walnut. Shrub or tree, the stems several from the base or the stem low-branching, forming a wide-spreading crown, much broader than high; leaflets 1¼ to 2½ in. long.—Coastal S. Cal. from Santa Barbara Co. to the Santa Ana Mts. and e. to the foothill cañons of the San Bernardino Mts. (south slope).

MYRICÀCEAE. Sweet-gale Family

Shrubs or small trees. Leaves simple, alternate, fragrant, resinous-dotted, without stipules. Flowers in oblong or cylindrical catkins, unisexual, solitary (or sometimes 2) and sessile in the axils of scaly bracts; perianth none. Staminate flower with 4 to 16 stamens; pistillate flower surrounded at base by 2 to 4 small bractlets; ovary superior, 1-celled, 1-ovuled; stigmas 1 to 4, filiform, sessile. Fruit a nutlet. Seed without endosperm.

1. MYRÌCA L. Wax Myrtle

The only genus. (Greek murike, the ancient name of the Tamarisk.)

Evergreen; staminate and pistillate flowers on same shrub; Coast Ranges.1. *M. californica.*
Deciduous; staminate and pistillate flowers on different shrubs; Sierra Nevada.....
2. *M. hartwegii.*

1. **M. califórnica** Cham. Wax Myrtle. Thickly branched shrub or small tree, 8 to 30 ft. high; leaves thickish, dark green, glossy, oblong, or oblanceolate-oblong, tapering above to an acute apex, narrowed below to a petiole, 2¼ to 5 in. long, remotely serrate or almost entire; catkins 2 to 9 (or 12) lines long, the pistillate in the upper, the staminate in the lower, axils; catkins with pistillate flowers above and staminate at base often occur between; stamens 5 to 16, united by their filaments into a cluster longer than the scale; fruit berry-like but really a small globose nut coated with resinous-waxy grains, 2 lines in diameter, the bractlets at the base minute.—Sand-dunes, moist flats or hillsides, Redwood forest slopes, or rocky declivities near the ocean; Santa Monica Mts. to the Santa Cruz Mts. and Del Norte Co.; n. to Wash. Mar.-Apr.

2. **M. hartwégii** Wats. Sierra Sweet Bay. Shrub 3 to 5 ft. high; leaves narrowly obovate or oblong, remotely serrulate, puberulent, petioled, (1 or) 2 to 3½ in. long; staminate catkins 1 in. long, the scales ovate-deltoid with scarious margin above the shortly clawed base; stamens 2 to 4, shorter than the scales; pistillate catkins globose, 1 to 1½ lines long, in fruit 5 to 7 lines long, sprinkled with resin globules; bractlets adnate to the sides of the

nutlet, enlarged and much thickened in fruit, acutely tipped, 1 line long; nutlet laterally compressed, shorter than the bractlets, not waxy.—Sierra Nevada, 1000 to 4000 ft.: Northfork (Madera Co.); Big Creek near Wawona; Rosasco, Tuolumne Co.; Eldorado Co., and n. to about Yuba Co. May-June. The foliage has an agreeable spicy fragrance.

URTICÀCEAE. Nettle Family

Herbs with simple leaves. Flowers small (ours less than 1 line long), greenish, unisexual, clustered, the clusters disposed in catkin-like axillary spikes or loose axillary heads. Petals none. Staminate calyx with 4 distinct or nearly distinct sepals and as many opposite stamens, the filaments coiled or bent inward in the bud so that when released, they fly upwards like a spring, scattering the pollen. Pistillate calyx 2 to 4-toothed or -cleft, or of nearly distinct segments. Ovary superior, 1-celled, with 1 orthotropous erect ovule; style and stigma 1. Embryo straight. Endosperm oily. Fruit an achene, always inclosed or covered by the calyx.

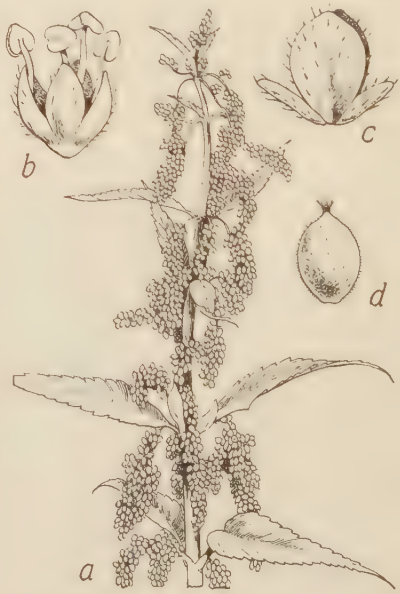
Leaves opposite, toothed, stipulate; hairs stinging; achene flattened.
Pistillate calyx 4-parted, the segments almost distinct, the inner ones largest..... 1. Urtica.
Pistillate calyx saccate, 2 to 4-toothed at orifice.....2. Hesperocnide.
Leaves alternate, entire, without stipules; hairs not stinging; achene ovoid; pistillate calyx tubular, 4-cleft.....3. Parietaria.

1. URTÌCA L. Nettle

Annual or perennial herbs with stinging hairs. Leaves opposite, petioled, 3 to 7-nerved, with stipules. Flowers in ours monoecious, clustered, the clusters in axillary, often branching spikes. Staminate flower with 4 sepals, 4 stamens and a cup-shaped rudiment of a pistil. Pistillate calyx with the sepals unequal, the exterior smaller than the inner and at length inclosing the flattened achene; ovary with sessile tufted or almost feathery stigma. Endosperm scanty. (Latin name of the nettle.)

Pistillate and staminate flowers in separate spike-like inflorescences; perennial.
Herbage gray; leaves ovate to lanceolate.....1. *U. gracilis.*
Herbage dark green; leaves broadly ovate, cordate at base.....2. *U. californica.*
Pistillate and staminate flowers mixed in the same cluster; herbage dark green; annual.....3. *U. urens.*

1. **U. grácilis** Ait. var. **holoserícea** Jepson. Fig. 312. Stem erect, unbranched, 4 to 10 ft. high; leaves long ovate to lanceolate, commonly green and with scattered bristles above, gray below with a short dense pubescence, coarsely serrate, 3 to 5 in. long; petioles ½ to 2 in. long; stipules narrowly oblong, mostly acutish, 2 to 6 lines long; flowers (as also in next) sessile in small clusters (glomerules), the clusters in dense simple or somewhat paniculately branched spikes; pistillate spikes ½ to 2 in. long, the staminate in axils below the pistillate and often twice as long; inner sepals not or scarcely exceeding achene; achene elliptic but acutish at apex and often at base, smooth. — Along creeks, about damp spots in the hills or mts., in moist valleys or in marshes, 10 to 9800 ft.: common and often abundant throughout Cal. except in the desert regions; n. to Wash. Var.



312. Urtica gracilis var. holoserícea Jepson; *a*, fl. stem x 1; *b*, staminate fl. x 6; *c*, pistillate fl. x 8; *d*, achene x 8.

GREÉNEI Jepson n. comb. Herbage yellowish green; achene with very short and obscure stipe.—W. Siskiyou Co. (f. greenei Jepson.) Var. DÈNSA Jepson n. comb. Herbage very gray; leaves on flowering portion of stem reduced, the paniculate spikes equaling or exceeding them, very numerous and forming a dense uninterrupted compound panicle.—Howell Mt.; lower Sacramento River. (f. densa Jepson.)

2. **U. califórnica** Greene. COAST NETTLE. Stem often branched from the base, 2 to 3 ft. high, producing stolons; stems and petioles hispid and somewhat pubescent; leaves broadly ovate, deeply cordate, coarsely serrate, subglabrous above, shortly pubescent below and often gray, 3 to 4 in. long and nearly as broad, or the lower 4 to 7 in. long; petioles 1 to 3 in. long; stipules oblong to elliptical, obtuse, 3 to 6 lines long; spikes simple or paniculately branched, mostly exceeding petioles; inner sepals equaling ovatish achene.—Lowlands near the coast from San Mateo Co. to Marin Co.; n. to Alas.

3. **U. ùrens** L. SMALL NETTLE. Fig. 313. Erect and simple or branching from the base, 1 to 1½ ft. high, leafy to the top, very sparingly hispid; leaves elliptic or ovate, coarsely laciniate-serrate, 3 to 5-nerved, ½ to 1½ in. long, slender petioled; stipules short, about 1 line long; flowers more or less pediceled in glomerules, the glomerules in an oblong rather dense spike often shorter than the petioles; fruiting calyx with hispid-ciliate margins.—South Coast Ranges and coastal S. Cal.; nat. from Eur.

313. Urtica urens L.; *a*, fl. stem x 1; *b*, staminate fl. x 5; *c*, pistillate fl. x 5.

2. HÉSPEROCNÌDE Torr.

Annual herbs similar to Urtica. Stipules minute. Staminate calyx with 4 almost distinct sepals. Pistillate calyx consisting of a membranous flattened oblong-ovate sac with a minutely 2 to 4-toothed orifice. (Greek hespera, west or western, and knide, a nettle.)

1. **H. tenèlla** Torr. Slender, erect or straggling, 1 or 2 ft. high; stems and petioles bristly with scattered hairs, the blades very sparsely hispid; leaves thin, ovate, serrately incised, ½ to 1½ (or 2) in. long on slender petioles; flowers densely glomerate in the axils, the clusters shorter than the petioles; pistillate calyx thin, hispid with hooked hairs, in fruit ½ to less than 1 line long; achene with minutely roughened surface.—Coast Ranges from Napa Valley to S. Cal.; Sierra Nevada foothills in Tulare Co.

3. PÁRIETÀRIA L. PELLITORY

Ours low unarmed annuals with alternate entire 3-nerved leaves without stipules. Flowers perfect and pistillate in axillary clusters, involucrate by small leafy bracts. Staminate calyx 4-parted. Pistillate calyx tubular-ventricose, 4-lobed. Achene ovoid, inclosed by the persistent calyx. (The ancient Latin name of the Italian species, because growing on walls.)

1. **P. débilis** Forst. Stems very slender, several from the base, diffuse, 4 to 10 in. long; herbage pilose or hispid, especially the stems and margins of leaves; leaves ovate to ovate-lanceolate, rounded at base or abruptly cuneate, often shortly attenuate to the obtuse apex, minutely papillate, 3 to 12 lines long, or the lowest very small, on petioles 1 to 3 lines long; clusters few-flowered.—Moist shady places: S. Cal. and n. to Inyo Co.; N. Am., S. Am., Asia, Austr.

ULMÀCEAE. Elm Family

Trees or shrubs with alternate simple leaves and fugacious stipules. Flowers perfect or polygamous. Calyx small. Corolla none. Ovary 1-celled; style or stigma 1. Fruit a samara or drupe.

1. CÉLTIS L. Hackberry

Flowers greenish. Calyx 5 or 6-parted, the staminate in cymose clusters at the base of the season's shoot, the pistillate solitary or in pairs in the leaf axils and peduncled. Calyx 5 (or 6)-parted. Staminate flower with 5 (or 6) stamens. Perfect flowers with pistil and 5 (or 6) stamens. Ovary 1-ovuled. Fruit a drupe. (Name of Pliny for a Lotus.)

1. **C. mississippiénsis** Bosc. var. **reticulàta** Sarg. Western Hackberry. Small spreading tree 8 to 30 ft. high; leaves ovate, unequal-sided at the cordate base, serrulate, scaberulous, 1 to 3 in. long on petioles 1 to 3 lines long; flowers 2 lines long; drupe berry-like, bluish, globose, 3 lines long, on peduncles 2 to 4 lines long.—Mt. ranges bordering the deserts: Independence; Caliente Creek, Kern Co.; cañon n. of Banning; Thing's Valley, Laguna Mt., San Diego Co.; e. to Col. and Tex., s. to Mex.

LORANTHÀCEAE. Mistletoe Family

Evergreen plants, parasitic on trees. Branches dichotomous. Leaves opposite, simple and entire, or often reduced to connate scales. Flowers dioecious (in ours), greenish and inconspicuous, regular, apetalous. Calyx 2 to 5-lobed. Stamens as many as the calyx-lobes and inserted upon them; anthers 1 or 2-celled. Ovary inferior, 1-celled. Fruit a berry with glutinous endocarp. Embryo straight, in copious endosperm.

Berry sessile; flowers globose; leaves foliaceous or scale-like.....1. Phoradendron.
Berry on a recurved pedicel; flowers mostly compressed; leaves scale-like and connate...
2. Arceuthobium.

1. PHORADÉNDRON Nutt. Mistletoe

Parasitic on mostly deciduous trees, the stems much branched and swollen at the nodes. Leaves foliaceous and coriaceous, or scale-like. Flowers sunk in the joints of the jointed spikes, usually several to each scale. Staminate calyx commonly 3-lobed, the anthers 2-celled, sessile on the base of the lobes. Pistillate calyx adherent to the ovary, the 3 teeth persistent on the globose semitransparent mucilaginous sessile berry. (Greek phor, a thief, and dendron, a tree.)

Joints of pistillate spike several-flowered, leaves foliaceous; anthers transverse, opening by pores.
Mature leaves essentially glabrous, 1 to 3½ in. long; var. macrophyllum of.....
1. *P. flavescens.*
Mature leaves villose-pubescent ½ to 1½ in. long.....2. *P. villosum.*
Joints of the pistillate spike 2-flowered.
Leaves foliaceous.....3. *P. bolleanum.*
Leaves scale-like.
Pistillate spike 1 (or rarely 2)-jointed; anthers transverse, opening by pores; stems glabrous; berries white.....4. *P. juniperinum.*
Pistillate spike 3 to 4-jointed; anthers oblong, opening by longitudinal slits; stems canescent; berries red.....5. *P. californicum.*

1. **P. flavéscens** Nutt. var. **macrophýllum** Engelm. Stems very woody, forming bushes 2 to 8 ft. in diameter; branches with long internodes, villose-pubescent when young to puberulent in age; herbage yellowish green; leaves obovate to elliptic, densely villose-pubescent when young, essentially glabrous at maturity, conspicuously veined with 3 to 5 prominent nerves, 1 to 3½ in. long, short-petioled; spikes 3 to 7-jointed, ½ to 1 in. long, the pistillate elongating to 1½ or 2 in. in fruit; spikes canescently short-villous; berries white, 2 to 3 lines in diameter.—Sacramento and San Joaquin valleys to S. Cal.; e. to Tex. Parasitic on soft-wood trees: Aesculus californica, Populus fremontii, Salix species. (P. longispicum Trel.)

2. **P. villòsum** Nutt. Common Mistletoe. Stems woody, forming bushes 1 to 4 ft. in diameter; branches with comparatively short internodes, densely villose and somewhat glandular-pubescent; herbage green; leaves

oblong to oblanceolate or obovate, inconspicuously 3 to 5-nerved, villose-pubescent, short-petioled, ½ to 1½ in. long; spikes short, not exceeding 1 in. in length when in fruit, often several at a node and thus fascicled; berries pinkish-white, 1½ to 2 lines long.—Foothills of the Coast Ranges and Sierra Nevada and s. to S. Cal.; e. to Ariz., n. to Ore. Parasitic chiefly on oaks.

3. **P. bolleànum** (Seem.) Eichler. Stems with short internodes, much branched; herbage glabrous; leaves small, narrowly oblong to spatulate or almost linear, ½ to 1 in. long, glabrous, nerveless; spikes very short, usually with only 1 joint, the staminate several (6 to 12)-flowered, the pistillate 2-flowered; berries (on account of their whiteness and translucency) pearl-like, 1¾ to 2 lines in diameter.—Coast Ranges and Sierra Nevada to S. Cal.; s. to Mex. On Cupressus species. (P. pauciflorum Torr).

4. **P. jùniperìnum** Engelm. Stems stout, erect, much branched, sometimes pendulous in age; herbage glabrous; internodes short; leaves reduced to scales; spikes usually 1-jointed; staminate spikes 6 to 8-flowered, the pistillate 2-flowered; berries waxy white, 1½ lines in diameter.—Sierra Nevada to S. Cal.; e. to N. Mex. Parasitic on Juniperus species. Var. LIBOCÈDRI Engelm. Stems more slender, erect at first, pendulous in age.—Sierra Nevada, s. to the high mts. of coastal S. Cal. Parasitic on Libocedrus decurrens. (P. libocedri Howell.)

5. **P. califórnicum** Nutt. MESQUITE MISTLETOE. Stems terete, with long very slender branches, these disposed to be pendulous; herbage grayish canescent; leaves reduced to scales; staminate spikes consisting of 2 or 3 (to 5) joints, each with 2 to 6 flowers; pistillate spikes consisting of 3 or 4 joints, each bearing 2 flowers; berries globose, reddish, 2 lines in diameter.—Mohave and Colorado deserts; e. to Ariz. Parasitic on Prosopis juliflora and pubescens, Larrea tridentata, and Acacia greggii. Var LEUCOCÁRPUM Jepson n. comb. Berries white.—Twentynine Palms; Andreas Cañon. (f. leucocarpum Trel.)

2. ARCEUTHÒBIUM Marsch-Bieb. PINE MISTLETOE

Plants yellow or brown, leafless, fragile-jointed, parasitic on coniferous trees. Stems quadrangular or angled. Leaves reduced to connate scales. Flowers solitary or several in each axil, crowded into apparent spikes, opening in autumn. Staminate flower:—calyx mostly 3-parted, compressed; stamens 3, the anthers sessile near the center of the calyx-lobes, roundish, 1-celled, opening by a circular slit. Pistillate flower:—calyx 2-cleft, the teeth laterally disposed, the ovary ripening the next autumn after flowering and exserted on the recurved pedicel. Berry circumscissile near the base, when fully ripe explosively dehiscent at a touch or when teased, the glutinous seed being expelled to a distance of several feet. (Greek arkeuthos, juniper, and bios, life.)—By studies of infection cultures J. R. Weir has shown that form, size and color of the plant and compactness of individual colonies varies with age or, more especially, with change of host and geographic location (Bot. Gaz. 66:1).

Plants minute, 5 to 12 lines long.....1. *A. douglasii.*
Plants normally 1¼ to 6 in. long.
Staminate flowers all terminal, on peduncle-like joints.....2. *A. americanum.*
Staminate flowers in the axils of the scales of a simple or compound spike.....
3. *A. campylopodum.*

1. **A. douglàsii** Engelm. Plant dwarfish, 5 to 12 lines long, usually thickly scattered as solitary inflorescences along the branch of the host (not fascicled in dense clusters); staminate plant smaller than the pistillate, sparingly branched; pistillate plant with 1 to 4 pairs of short lateral branches; fruit small, glaucous, purplish, 1 to 2 lines long, slightly laterally compressed and thus forming a slight ridge on each side when mature.—S. Cal. (on Pseudotsuga macrocarpa); n. Lake Co. and Mt. Shasta (on Pseudotsuga taxifolia); e. to Col., n. to Wash.

2. **A. americànum** Nutt. Plants slender, much branched, 1⅔ to 4¾ in. long, often 3 to 5 branches arising from a single joint; staminate flowers on

the ends of very short peduncle-like joints, when in anthesis appearing as if in whorls of 2 to 5 flowers at the joints or in the axils of the branches; pistillate flowers borne in the axils of the scales of a spike, the joints of the spike elongating in fruit; fruit glaucous, bluish-purple, 1½ to 2 lines long.—Sierra Nevada (on Pinus contorta var. murrayana): House Mdws., North Fork Kings River; Little Yosemite; Truckee; n. to Ore.

3. **A. campylopòdum** Engelm. Plant robust, 1¼ to 6 in. long; flowers arranged oppositely in a 4-ranked spike, 2 flowers to each very short joint; staminate spikes robust, usually yellow with orange flowers, 2½ to 10 lines long, about 1½ lines wide; perianth segments usually 3, unlike (the 2 lateral more or less boat-shaped, the other broadly lanceolate, obtuse); pistillate spikes somewhat smaller, 2½ to 5 lines long, ¾ to 1 line wide, either simple or compound, with several 2 and 3-jointed opposite spikelets, the joints elongating in fruit; fruit glaucous, bluish-purple, slightly compressed, with a longitudinal ridge on each side, 2 to 2½ lines long, ovoid.—Almost throughout Cal. in the foothills and mts., chiefly on Pinus species, occasionally on Abies concolor. Var. CRYPTOPÒDUM Jepson n. comb. Staminate inflorescence slender, ½ to ¾ line wide, the larger spikes 7 to 15-flowered; pistillate plant somewhat smaller, about the same color as the staminate.—Mt. San Jacinto (on Pinus lambertiana); Humboldt Co. coast (on Abies grandis). (A. cryptopodum Engelm.) Var. DIVARICÀTUM Jepson n. comb. Staminate plants with slender main branches, their spikes slender, short, 1 to 2½ lines long, ½ line wide, the larger spikes 3 to 5-flowered; pistillate plants with stout main branches, their spikes slender, 2 to 9-flowered, 1½ to 3½ lines long, ¾ line wide.—Desert slopes or ranges in the Mohave Desert; e. to N. Mex. On Pinus cembroides var. monophylla. (A. divaricatum Engelm.)

SANTALÀCEAE. Sandalwood Family

Herbs or shrubs, usually root parasites. Leaves simple, entire. Flowers small, in ours perfect, mostly greenish. Corolla none. Calyx valvate, 4 or 5-cleft, the lower part of the tube adherent to the ovary. Stamens 3 to 6, inserted opposite the calyx lobes and between the lobes of the disk. Ovary 1-celled; style one; stigma capitate; ovules 2 to 4, suspended from the top of a free central placenta. Fruit indehiscent, nut-like, 1-seeded. Seeds without testa. Embryo small, axile at one end of the abundant endosperm.

1. COMÁNDRA Nutt. Bastard Toad-flax

Perennial herbs with rootstocks, striate stems and glabrous herbage. Leaves alternate, nearly sessile, the lowest scale-like. Flowers greenish white, in small terminal or axillary cymose clusters. Calyx campanulate or urnshaped, 5-cleft. Anthers borne on filaments and also attached to calyx-lobes by a tuft of thread-like hairs. Placenta filiform, contorted. Fruit nut-like, crowned by the persistent calyx-lobes, the cavity filled by a globular seed. (Greek kome, hair, and ander, man, referring to the hairy appendages of the stamens.)

1. **C. umbellàta** Nutt. Stems many from a somewhat woody base, 5 to 12 in. high; leaves green or pallid, oblong, acute at base and apex, ½ to 1 in. long, shortly petioled; flowers 2½ lines long; fruit globose, the size of a pea, the persistent calyx-lobes forming a sort of neck.—Mt. slopes, 5000 to 6000 ft.: Sierra Nevada; n. to B. C., e. to the Atlantic. July-Aug. Parasitic on the roots of shrubs.

ARISTOLOCHIÀCEAE. Birthwort Family

Perennial herbs or twining shrubs. Leaves simple, alternate, petioled, cordate. Flowers perfect, apetalous, with a petal-like synsepalous 3-lobed calyx. Stamens 6 to 12 with extrorse anthers. Styles 6 or 1. Ovary inferior, 6-celled. Fruit a fleshy or dry capsule. Seeds in 1 or 2 rows on the inner angle of each cell, with a minute embryo in copious endosperm.

Calyx regular, persistent; capsule irregularly dehiscent.....1. ASARUM.
Calyx irregular, deciduous; capsule septicidally dehiscent.....2. ARISTOLOCHIA.

1. ÁSARUM L.

Nearly acaulescent herbs with fragrant slender creeping rootstocks bearing 2 or 3 scale-like bracts, then 1 or 2 reniform or cordate leaves on long closely approximate petioles and a short-peduncled flower close to the ground in the axil of the lower leaf. Calyx regular, campanulate, the limb 3-parted, the lobes spreading or recurved. Stamens 12, nearly free from the styles, at first reflexed, the alternate ones shorter; filaments more or less distinct, the connective usually continued beyond the anther into a point. Styles 6, more or less united. Capsule globose, fleshy, commonly bursting irregularly. Seeds large, thick, 2 rows in each cell. (Derivation obscure.)

Rootstock stolon-like, remotely scaly; styles united, equaling the stamens.
Calyx-lobes 1 in. long or more ..... 1. *A. caudatum.*
Calyx-lobes 4 to 6 lines long ..... 2. *A. lemmonii.*
Rootstock rather closely scaly; styles nearly distinct ..... 3. *A. hartwegi.*

1. **A. caudàtum** Lindl. WILD GINGER. Leaves cordate-reniform, shortly acute or obtusish, pubescent below and above on the veins, 2 to 6 in. broad, on petioles 3 to 7 in. long; peduncles 6 to 12 lines long; calyx-lobes triangular or oblong, attenuate into a tail which is 1 to 2¼ in. long; filaments stout, the free apex of the connective much shorter than the anther; styles united, equaling the stamens.—Deep shade of Coast Range woods, in Cal. following rather closely the Redwood belt from the Santa Cruz Mts. to Del Norte Co.; n. to B. C.

2. **A. lemmònii** Wats. Leaves thin, rounded at summit; flowers mostly glabrous; calyx-lobes only 4 to 6 lines long, obtuse or acute; connective only slightly produced beyond the anther.—N. Sierra Nevada in Plumas and Sierra Cos.

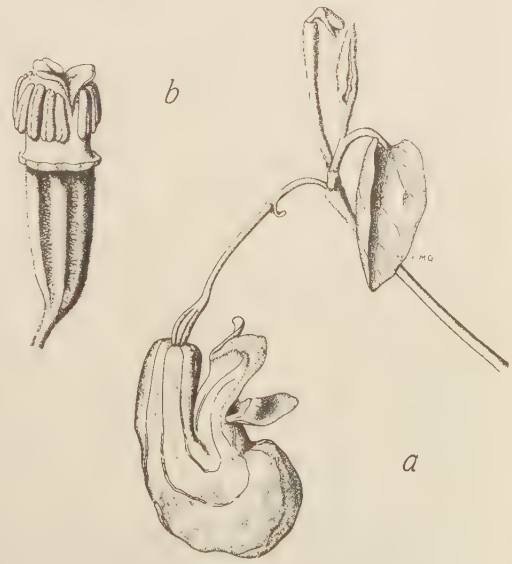
3. **A. hártwegi** Wats. Leaves 2 to 5 in. broad, strikingly mottled, pubescent below, glabrous above or sometimes pubescent along the lateral veins; flowers on pedicels ½ in. long; calyx long, hairy outside, the tube 6 to 8 lines long, the lanceolate attenuate lobes twice as long; connective as long or twice as long as anther.—Montane, 4000 to 7000 ft.: Sierra Nevada from Tulare Co. to Siskiyou Co., thence to Humboldt Co.; n. to Ore.

2. ARÍSTOLÒCHIA L.

PIPE VINE

Twining shrubs with sparingly branched stems and axillary pendulous flowers. Calyx tubular, strongly curved and pipe-shaped. Anthers 6, rarely 7 or 8, sessile, disposed in pairs and adnate to the short simple style. Stigma 3 to 6-lobed or -angled. Capsule 6-angled and 6-valved, septicidally dehiscent. Seeds horizontal, in one row in each cell, numerous. (Greek aristos, best, locheia, parturition, from its supposed efficacy in child-birth.)

1. **A. califórnica** Torr. DUTCHMAN'S PIPE. Fig. 314. Deciduous woody climber, twining 5 to 12 ft. high on shrubs, the herbage more or less pubescent, sometimes silky; leaves



314. Aristolochia californica Torr.; *a*, fl. branch x ⅝; *b*, pistil and stamens x 3.

ovate, cordate, 1½ to 3 (or 5½) in. long, on petioles 1 or 2 in. long or less; calyx greenish, veined with purple, 1⅛ to 1½ in. long; inside of tube near the base with a broad dull purple band; limb 2-lipped, the upper of 2 broad obtuse lobes, the lower entire; ovary clavate; stigma 3-lobed; capsule broadly oblong-obovate, abruptly contracted to a slender base, 6-winged, the body 2 to 2½ in. long.—Low wooded hills: Coast Ranges from Monterey Co. to Shasta Co., thence s. in the Sierra Nevada foothills to Sacramento Co., Mar.-Apr.

SAURURÀCEAE. Lizard-tail Family

Ours perennial herbs, with nodose scape-like stems and alternate entire petioled leaves. Flowers perfect, bracteate, in a dense terminal spike. Perianth none. Stamens in ours 5 to 8. Ovary 1-celled, with 1 to 5 stigmas. Fruit a capsule or berry.

1. ANEMÓPSIS Hook.

Stoloniferous herb with aromatic rootstock and astringent somewhat spicy herbage. Leaves mostly basal. Spike conical, surrounded at base by a persistent showy involucre of 5 to 8 bracts; each flower (except the lowest) also subtended by a small white bract. Ovary sunk in the rachis of the spike; stigmas 2 or 3. Capsule dehiscent at the apex. (Greek anemone, and opsis, appearance, the inflorescence resembling the flower of Anemone.)

1. **A. californica** (Nutt.) Hook. Yerba Mansa. Fig. 315. Stems hollow, ½ to 2 ft. high, with a broadly ovate or elliptic clasping leaf above the middle and a fascicle of 1 to 3 small petioled leaves in the axil; basal leaves elliptic-oblong, rounded above, often somewhat narrowed toward the cordate base, 2 to 8 in. long, on petioles 1 to 8 in. long; spikes ½ to 1½ in. long; involucral bracts white (or reddish beneath), oblong, ½ to 1¼ in. long; floral bracts obovate, clawed, 2½ to 3 lines long; ovules 6 to 10 on each placenta.—Common in saline and rather wet lowlands: lower Sacramento Valley; San Joaquin Valley; South Coast Ranges; Inyo Co.; S. Cal.; e. to Utah and Tex., s. to Mex. An infusion of the root is used by Spanish-Californians, both as a liniment for skin troubles and as a tea for disorders of the blood.

315. Anemopsis californica Hook.; *a*, upper portion of fl. stem x ¼; *b*, detail of fl. x 8.

Rafflesiàceae. Pilostyles thúrberi Gray, a small leafless parasite with minute flowers, will probably be found on Dalea in the Colorado Desert.

PÓLYGONÀCEAE. Buckwheat Family

Ours herbs or low bushes with simple leaves. Flowers small, regular, mostly perfect, without corolla, and rarely solitary. Calyx 5 to 6-cleft or -parted. Stamens 3 to 9, more or less attached to the calyx. Ovary superior, 1-celled, 1-ovuled and bearing 2 or 3 styles or stigmas. Fruit an achene, mostly triangular in ours, sometimes lenticular.

Leaves alternate or basal, always with sheathing stipules; involucre none.
  Sepals 5, equal and erect in fruit; stigmas capitate ..... 1. Polygonum.
  Sepals unequal, the inner row erect and enlarging in fruit, the outer row reflexed; stigmas tufted.
    Leaves not reniform; sepals 6 ..... 2. Rumex.
    Leaves reniform; sepals 4 ..... 3. Oxyria.
Leaves opposite or basal, without sheathing stipules.
  Flower or flowers subtended by one or several distinct bracts, or none.
    Bract enlarged in fruit, 1-flowered, 2-lobed, 2-saccate on the back ..... 4. Pterostegia.
  Bracts not saccate or enlarged in fruit, or bracts none.
    Bracts none; stamens 9 ..... 5. Phyllogonum.

Bracts present.
Flowers in clusters; bracts woolly.
Calyx glabrous; stamens 3.....6. NEMACAULIS.
Calyx woolly; stamens 5 to 9.....7. HOLLISTERIA.
Flowers solitary; bracts naked; stamens 3.....8. LASTARRIAEA.
Flowers borne in a tubular or turbinate involucre.
Involucral teeth spine- or bristle-tipped.
Involucre mostly 5 or 6-toothed, usually 1-flowered; stamens 3, 6, or 9; involucral lobes usually tipped with hooked spines.....
9. CHORIZANTHE.
Involucre 4 or 5-cleft (usually deeply), 2 to many-flowered; stamens 9; involucral lobes ending in straight bristles.....10. OXYTHECA.
Involucre 3 to 8-toothed, the teeth not bristle-tipped.....11. ERIOGONUM.

1. POLÝGONUM L. KNOTWEED

Herbs, some water plants, some woody at base. Leaves entire, alternate, with scarious sheathing stipules ("sheaths"), these entire, ciliate or lacerate. Inflorescence various, the flowers on jointed pedicels. Calyx red, white, or sometimes greenish, usually 5-cleft or -parted, the divisions erect in fruit. Stamens 3 to 9. Styles 2 or 3. Achene lenticular or triangular, inclosed in the fruiting calyx. Embryo curved, lying in a groove at an angle of the endosperm. (Greek polus, many, and gonu, knee, on account of the nodose zigzag stem of many species.)

A. Leaves not cordate.

1. Flowers in axillary clusters or in spikes, racemes or panicles.

Leaves mostly broad or ample, not jointed to the petiole.
Alpine or subalpine perennials with thick rootstocks; stamens 8; achene triquetrous.
Flowers in a single dense terminal raceme; stem simple; herbage glabrous.—Subgenus BISTORTA.....1. *P. bistortoides.*
Flowers in clusters or panicles; calyx articulated with the pedicel.—Subgenus ACONOGON.
Flowers numerous in panicles.....2. *P. alpinum.*
Flowers 2 to 4 in axillary clusters.....3. *P. davisiae.*
Low valleys or at middle altitudes; flowers in spikes (usually geminate or paniculate), with small scarious bracts; calyx appressed to the triquetrous or lenticular achene; stamens 4 to 8, filaments filiform; sheaths cylindrical, truncate, entire.—Subgenus PERSICARIA.
Spikes 1 or 2; flowers red; stamens 5, exserted; achene lenticular; aquatic or marsh perennials.
Leaves elliptical or oblong; spikes oblong or ovate, ½ to 1 in. long.....
4. *P. amphibium.*
Leaves ovate-lanceolate; spikes more elongated, 1 to 3 in. long.....
5. *P. muhlenbergii.*
Spikes several to many, in 2s or more or less paniculate; stamens 6 to 8, included; achene either lenticular or triangular; stream borders or marshy places.
Sheaths naked in age; spikes often drooping; sepals white or flesh-color; stamens 6; annual.....6. *P. lapathifolium.*
Sheaths truncate or truncatish, fringed with bristles; spikes erect.
Calyx not punctate.
Internodes strongly swollen above the nodes.....7. *P. fusiforme.*
Internodes not swollen.
Herbage mostly glabrous; annual.....8. *P. persicaria.*
Herbage strigillose; perennial.....9. *P. hydropiperoides.*
Calyx punctate; perennial.....10. *P. acre.*
Leaves mostly narrow and lanceolate, jointed upon a short petiole adnate to the short sheath of the scarious stipules; flowers in axillary clusters, the clusters either more or less separated or crowded into a terminal leafy spike; stamens mostly 8, the filaments or some of them often dilated at base; achene triquetrous.—Subgenus AVICULARIA.
Perennial and more or less suffrutescent.
Leaves revolute; flowers several in a cluster, crowded at the ends of the branches.
11. *P. paronychia.*
Leaves plane; flowers 1 to 3 in each axil, less crowded.
Leaves linear; dry foothills.....12. *P. bolanderi.*
Leaves oblong or obovate; alpine.....13. *P. shastense.*
Annuals.
Plants prostrate; branches leafy to the ends.....14. *P. aviculare.*
Plants erect or ascending.
Flowers in axillary clusters; leaves little reduced upwards.
Leaves mostly linear-oblong to lanceolate or oblanceolate.
Stems branching above; achenes dull.....15. *P. ramosissimum.*
Stems branching at base; achenes shining....16. *P. sawatchense.*
Leaves ovate to elliptic; achenes shining.....17. *P. minimum.*
Flowers in very loose spikes; leaves much reduced upwards; plants ½ to 1½ ft. high.
Flowers deflexed; achenes black, shining.....18. *P. douglasii.*

Flowers erect; achenes brownish, dull.....19. *P. spergulariaeforme.*
Flowers in dense terminal leafy spikes; plants ½ to 4 in. high.....
20. *P. imbricatum.*

2. Flowers strictly solitary in the axils of the leaves or bracts.

Internodes in ours very short and the branches spike-like; stamens 8; achene triquetrous; leaves very narrow, not jointed to the lacerate stipule; ours slender wiry brittle annuals.—Subgenus DURAVIA.
Sheaths conspicuously lacerate.
Stems flowering above the base; sheaths lacerate into more or less bristle-like segments.....21. *P. californicum.*
Stems flowering from very base; stipules cottony.....22. *P. parryi.*
Sheaths 2-parted, the segments sharply but shortly toothed.....23. *P. bidwelliae.*

B. Leaves cordate.

Flowers in loose panicled racemes; stamens 8; achene triquetrous: twining plants.—Subgenus BILDERDYKIA.....24. *P. convolvulus.*

1. **P. bistórtoides** Pursh. Stems several from a thick horizontal rootstock, 1 to 2¼ ft. high, the leaves mostly basal, those above reduced and bract-like; leaves erect, oblong to linear-oblong, 4 to 8 in. long, the petioles half to as long; raceme dense, spike-like, ¾ to 1½ in. long; flowers white, on slender pedicels, 2 to 4 lines long.—High wet meadows, Sierra Nevada, San Bernardino Mts. and North Coast Ranges; e. to the Rocky Mts. and far n.

2. **P. alpínum** All. Stems stout, erect, 2 to 7 ft. high, arising from a fleshy rootstock, 1 to 2 in. in diameter; herbage glabrous or nearly so; leaves ovate, acuminate, 3 to 6 in. long, the short petiole narrowly wing-margined to the base; panicles terminal, loose, nearly or quite leafless, 3 to 7 in. long; flowers white.—Subalpine, Yosemite to Mt. Shasta and w. to Marble Mt.

3. **P. davísiae** Brew. Stems simple or sparingly branched, 5 to 11 in. high, several from the crown of a thick taproot 1 or 2 in. in diameter; leaves ovate or oblong-ovate, minutely pubescent, often glaucous, ¾ to 1½ in. long, subsessile or shortly petioled; flowers purplish green or yellowish, 2 to 4 in loose terminal or axillary clusters; achene half exserted from the persistent calyx.—High mts., 6000 to 8000 ft.: n. Sierra Nevada from Alpine Co. to Shasta Co.; North Coast Ranges from Lake Co. to Siskiyou Co.

4. **P. amphíbium** L. WATER PERSICARIA. Aquatic glabrous perennial with stout stems not branching above the rooting base; leaves floating, elliptical to oblong or oblong-lanceolate, truncate or rounded at base, 2 to 7 in. long on petioles ⅞ to 2½ in. long; sheaths leaf-bearing at about the middle; spike terminal, dense, ovate or oblong, ½ to 1 in. long, on a commonly short peduncle; calyx bright rose-color, 1½ to 3 lines long, the 5 stamens and 2-cleft style exserted; achene lenticular.—Ponds and lakes in S. Cal.; Sierra Nevada; n. to B. C., e. to Atlantic; Eur., Asia. Often terrestrial and almost equally successful as a land or water plant. Var. HARTWRIGHTII Bissel. Sheaths rough-hairy, ciliate, usually with an abruptly spreading herbaceous margin.—Upper Sacramento Valley and n. Sierra Nevada; e. to the Atlantic.

5. **P. muhlenbérgii** Wats. Perennial, aquatic or in half dry places; stems decumbent or suberect, 2 to 3 (or 6) ft. high; leaves and upper portion of the simple stem usually appressed-hirsutulose or scabrous, the peduncle glandular with short hairs; leaves thin, ovate-lanceolate to lanceolate, acuminate or even attenuate, usually rounded at base, 3 to 8 in. long, the petioles 1 to 3½ in. long; spikes 1 to 4 in. long, often in pairs; calyx rose-color or pink, 5-parted to the middle; stamens 5, exserted; style 2-cleft; achene lenticular.—Lakes and sluggish streams from the coast to the Sacramento Valley; throughout N. Am.

6. **P. lápathifólium** L. COMMON KNOTWEED. WILLOW-WEED. Annual, commonly stout, 1 to 4 ft. high, branching; herbage glabrous except a very scanty glandular pubescence on the peduncles and a scabrous pubescence on the leaf-margins or the leaves beneath sometimes resin-dotted; leaves broadly lanceolate, mostly long-acuminate, cuneate at base, 4 to 5 in. long, short-petioled; spikes axillary and terminal, oblong and erect or linear and nodding, 1 in. long or more; bracts ovate, acute; calyx white or flesh-color;

stamens 6, included; achene lenticular or rarely triangular.—Common along streams or in marshy lands, often whitening great areas; nat. from Eur. Aug.-Sept. Var. INCÀNUM Koch. Small, slender; leaves whitish beneath.—Berkeley, etc.

7. **P. fusifórme** Greene. Stems several or many from the base, dark red, assurgent, 2 to 3 ft. high, the internodes fusiform-thickened above the nodes; leaves linear-lanceolate, acuminate at both ends, glabrous or strigulose on midrib, 2½ to 4 in. long, subsessile; sheaths strigulose outside and at first shortly ciliate at summit; bracts obtuse, shortly ciliate; racemes dense, 1 to 1½ in. long, usually paniculate; calyx red in bud, mostly white in anthesis, its segments 5 (or 4); stamens "4" to 7; achene "lenticular" or triquetrous, black, shining.—Colorado River Valley.

8. **P. persicària** L. LADY'S THUMB. Annual; resembling P. lapathifolium but sheaths strigose and the upper sheaths and the truncatish bracts ciliate; leaves subsessile; spikes shorter and erect; calyx red or white, not glandular; stamens generally 6, included.—Widely distributed in N. Am.; nat. from Eur.

9. **P. hydropìperoìdes** Michx. Perennial; stems 1 to 3 ft. high, branching; sheaths hairy; spikes slender or filiform, often interrupted below; calyx small, flesh-color or whitish, not dotted; stamens 8.—Monterey coast; Tulare Co.; coastal S. Cal.

10. **P. àcre** H.B.K. DOTTED SMART-WEED. Perennial, rooting and decumbent at base, erect and branching above, 2 to 5 ft. high, glabrous or the margin of the leaves scabrous; leaves ovate-lanceolate to linear-lanceolate, acuminate, attenuate to a very short petiole, 2 to 3 in. long; sheaths mostly bristly-ciliate, the short truncate bracts mostly naked; spikes loose and slender, 1 to 3 in. long, erect on long peduncles or panicled; calyx greenish, conspicuously glandular-dotted; stamens 8; achene lenticular or triangular. —Common in low and especially marshy ground or in moist mt. mdws.: e. to the Atlantic; trop. Am. Sept.

11. **P. paronýchia** C. & S. Stems from large woody rootstocks, suffrutescent, prostrate or ascending, 1 to 3 ft. long; branches leafy above, below clothed with old sheaths; sheaths large, 4 to 6 lines long, brown and 5-nerved, the margin freely lacerate above, persistent, the segments becoming hair-like in age; leaves linear-lanceolate, 5 to 8 (or 11) lines long, acute, the margin revolute; flowers about 3 in an axil, on short pedicels, densely crowded at the ends of the branches in short more or less leafy spikes; sepals white or rose-color, oblong-ovate, the green midvein with pinnately toothed outline; stamens 8, the 3 inner dilated at base.—Sand-hills along the coast: Monterey Co. to Del Norte Co.; n. to B. C.

12. **P. bolánderi** Brew. Stems many, erect, 5 to 10 in. high, arising from a woody taproot or from prostrate woody branches; leaves narrowly linear to subulate, acute or cuspidate, 2 to 8 lines long, not revolute; sheaths persistent, 2-lobed on each side, the lower lobes finely lacerate; flowers white or rose-color, 1 or occasionally 2 in the axils on the branchlets; stamens 8 or 9.—Rocky outcroppings: Napa and Hood's Peak ranges; n. Humboldt Co. July-Sept.

13. **P. shasténse** Brew. Stems mostly simple, 2 to 6 in. long, several from the branching crown of a very thick perennial root; leaves oblong or obovate, 3 to 4 in. long; stipules broad, silvery; flowers red or white, 2 or 3 in the axils; stamens 8.—High Sierra Nevada, 7000 to 9000 ft.; n. to Mt. Mazama, Ore.

14. **P. áviculàre** L. WIRE GRASS. YARD GRASS. Annual; stems wiry, minutely striate, prostrate or ascending, often several ft. long, flowering from the base; herbage glabrous and green; leaves oblong, acute, 3 to 6 lines long; flowers on very short pedicels, 2 lines broad when expanded; calyx cleft, the oblong lobes white with a green center; stamens 8, the 3 inner with dilated bases; styles 3, very short; achene ovoid, dark brown, minutely granular.—Nat. from Eur.; common in hard, especially beaten soils, and sometimes

in cultivated lands; flowering through the dry season and until after the rains break. Var. LITTORÀLE Koch. Leaves thick, often obtuse.—Maritime form.

15. **P. ramosíssimum** Michx. Annual, with the aspect of P. aviculare but erect and 1 to 2 ft. high; leaves oblong to lanceolate, ¾ to 1¼ in. long, somewhat reduced above; calyx greenish or yellowish; stamens 3 to 6; achene black, dull.—Rare in Cal.: Pasadena; Yosemite; n. to Saskat., e. to the Atlantic.

16. **P. sawatchénse** Small. Stems erect, mostly branched at base, 5 to 9 in. high; leaves oblanceolate, acute, mucronate, 4 to 9 lines long; flower clusters in all the axils from base to apex; stamens 6 to 8; style almost none.—E. side of the Sierra Nevada in Nevada Co.; e. to Col., n. to Wash.

17. **P. mínimum** Wats. Annual; stems usually several from the base, 2 to 4 (or 6) in. long, ascending; herbage glabrous, scaberulous at the nodes; leaves ovate or elliptic, 2 to 6 lines long, apiculate, evenly distributed or somewhat crowded at ends of branches; flowers in all the axils, greenish white; stamens 5 to 8; achene slightly exserted, black, smooth, shining.—Montane, 4000 to 7000 ft.: Sierra Nevada from Mariposa Co. to Nevada Co.; Siskiyou Co.; e. to Utah, n. to Alas.

18. **P. douglásii** Greene. Annual, mostly sparingly branched and strictly erect, 8 to 21 in. high; leaves linear-oblong or -lanceolate, acute, thinnish, 1 to 1¼ in. long; sheaths lacerate; flowers reddish, 2 lines long, scattered, on deflexed pedicels; achene triquetrous, jet-black, smooth and shining.—High mts., 4000 to 8000 ft.: S. Cal.; Sierra Nevada; e. to Tex. and Me. Var. LATIFÒLIUM Greene. Leaves oblong; flowers mostly crowded towards the ends of the branches.—Pacific Coast. Var. AÚSTINAE Jones. Leaves ovate to lanceolate, 3 to 6 lines long; calyx green with whitish margins, 1 line long; achene black, smooth and shining.—Modoc Co., n. to Ida.

19. **P. spergulàriaefórme** Meisn. Annual, much branched and somewhat diffuse, or sparingly branched and more strictly erect, 4 to 13 in. high; sheaths with a short mostly scarious base and lacerate summit; leaves linear or oblanceolate, 1-nerved, acute, ½ to 1½ in. long; spikes 4 inches long or less, very slender, the flowers much scattered below, crowded above; calyx rose-color or white; stamens 8, included, the filaments hardly dilated at base; style as long as the ovary, 3-parted.—Dry hills: Humboldt Co. to Siskiyou Co.; n. to B. C. Oct.

20. **P. imbricàtum** Nutt. Annual; stem branching from the base or sometimes simple, erect, 1 to 3 in. high, the upper leaves scarcely smaller but crowded and with flowers crowded in their axils; leaves linear, acute, 3 to 5 lines long; stipules 2-cleft, the lower segments of each pair more or less united; flowers greenish white, very shortly pediceled; stamens 5; styles nearly obsolete; achene brown, dull, smooth.—High montane, 6000 to 8000 ft., Yosemite Park to Donner Lake; e. to Col., n. to Wash. Var. WATSÒNII Small. Terminal portion of the stem or branches crowded with leaves and flowers; leaves linear to lanceolate, ½ to 1 in. long or the uppermost 1 to 3 lines long; flowers whitish or rose-color, 1 or 2 in each axil; stamens 3 to 5; styles evident; achene dark or black, the surface lightly lineate or very shallowly alveolate.—Alpine or subalpine, 9000 to 10,000 ft.: Mt. San Jacinto; South Yollo Bolly; Sierra Nevada; e. to Col., n. to B. C.

21. **P. califórnicum** Meisn. Slender wiry glabrous annual, 3 to 7 in. high, diffusely branched, the ultimate branches elongated and floriferous; leaves linear to filiform, cuspidate, 3 to 8 lines long, the back with strong midrib and revolute-ribbed on each margin; spikes often loose below, usually dense above with the sheaths overlapping; bracts lanceolate or subulate, 1 to 3 lines long; sheaths split to the middle or to the base into setaceous divisions; sepals white with rose-colored midvein; achene brown.—Dry foothills, Sierra Nevada and North Coast Ranges; n. to Wash. July.

22. **P. párryi** Greene. Dwarf compact annual, commonly branching from the base, 1 to 2 in. high; stems rigid and brittle, spike-like, because densely

crowded with leaves and flowers even to the base; leaves narrowly linear, acute, cuspidate, 1 to 4 lines long; stipules so extremely lacerate as to appear cottony, and often hiding the flowers; achene triangular, chestnut-color.—Cuyamaca Mts., n. Sierra Nevada; higher North Coast Ranges; n. to Wash. June-July.

23. **P. bidwélliae** Wats. Annual; stems divergently branched, 1 to 4 in. high; leaves linear, 3 to 5 lines long, with a strong midrib and two marginal nerves on back; stipules ovate, sharply serrate or at length lacerate, imbricated on the spikes; calyx rose-color.—Chico; not otherwise known.

24. **P. convólvulus** L. Black Bindweed. Twining or trailing annual, the stems 1 to several ft. long; herbage glabrous, pale green; leaves 1 to 2 in. long, ovate, sagittate at base, acuminate at apex; flowers in axillary clusters or disposed in a raceme; calyx 5-cleft, in fruit minutely scurfy, closely investing the black achene.—Nat. from Eur.: Sisson; Ft. Bidwell; Yosemite; San Francisco.

2. RÙMEX L.

Weed-like herbs, ours perennial except one. Leaves mostly basal, those on the stem alternate, the petioles with somewhat sheathing stipules. Flowers mostly greenish, sometimes reddish or yellowish, pediceled and borne in usually crowded whorls along the branches of the panicle. Calyx of 6 nearly distinct sepals, the 3 outer spreading or reflexed, the 3 inner larger, continuing to grow after flowering and hugging the achene, 1 or more of them in many of our species bearing a wart or callous grain on the back. Fruits, therefore, more conspicuous than the flowers. Stamens 6. Styles 3, short; stigmas tufted (wind-pollinated) and maturing before the stamens. Achene triangular. (Old Latin name used by Pliny.)

Flowers perfect or some staminate on the same plant; inner sepals commonly reticulated, in fruit becoming much longer than the achene; pedicels jointed; roots yellow, scented, bitter.—Lapathum DC. (Docks).
- Inner fruiting sepals entire (or nearly so) and
  - Without callous grains; pedicels not very prominently jointed.
    - Leaves rounded to acute at base.
      - Inner fruiting sepals broader than long.....1. *R. venosus.*
      - Inner fruiting sepals longer than broad.....2. *R. hymenosepalus.*
    - Leaves cordate at base.....3. *R. occidentalis.*
  - With callous grains (or 1 or 2 of the sepals naked), 1 to 2½ lines long; pedicels prominently jointed near the base.
    - Leaves strongly undulate, elliptical to oblong-lanceolate; fruiting sepals with a broad wing bordering the callous grain.....4. *R. crispus.*
    - Leaves slightly undulate; callous grain nearly covering fruiting sepals, leaving only a narrow wing.
      - Leaves linear, spatulate or oblong; callous grain toothed..... 5. *R. berlandieri.*
      - Leaves oblong or ovate; callous grain not toothed..6. *R. conglomeratus.*
    - Leaves plane, mostly lanceolate; fruiting sepals triangular, usually much larger than the callous grain.....7. *R. salicifolius.*
- Inner fruiting sepals with very prominent slender teeth or bristles; callous grains 1 to 3.
  - Perennial; flowering branches elongated and
    - Spreading at wide angles; pedicels jointed near the middle...8. *R. pulcher.*
    - Suberect; pedicels jointed near the base.....9. *R. obtusifolius.*
  - Annual; flowering branches usually short, the whorls mostly spicate-crowded; pedicels jointed near the base.....10. *R. persicarioides.*

Flowers dioecious; callous grains none or minute; roots red, scentless.—Acetosa DC. (Sorrels).
- Leaves not lobed; sepals longer than achene; pedicels jointed.....11. *R. paucifolius.*
- Leaves hastate; sepals shorter than achene; pedicels not jointed.....12. *R. acetosella.*

1. **R. venòsus** Pursh. Stems erect, ¾ to 1½ ft. high, from a running rootstock; leaves ovate or lanceolate, 2½ to 4 (or 6) lines long, on short petioles, with conspicuous dilated stipules; panicle nearly sessile, short, dense in fruit; inner fruiting sepals entire, without grains, round-cordate, 6 to 8 lines long and 8 to 14 lines broad.—Dry sandy valleys: Honey Lake Valley, Lassen Co.; Nev. to Wash. and Mo.

2. **R. hymenosépalus** Torr. Canaigre. Stem 1 to 2 ft. high, nearly simple, arising from a cluster of 2 to 12 tuberous or dahlia-like roots and ending above in a dense panicle ½ to 1 ft. long; leaves oblong, or tapering to each end, slightly succulent, somewhat wavy-margined, ½ to 1 ft. long; sheath-

ing stipules conspicuous; pedicels jointed near the middle, ½ to nearly as long as the fruit; inner sepals membranous and rosy in fruit, ovate, cordate at base, naked, 4 to 6 lines long.—Dry sandy washes and sandy plains from Kern Co. and San Luis Obispo Co. to S. Cal.; e. to N. Mex. Roots used in tanning leather. The stem is used as a substitute for rhubarb, whence the names Wild Rhubarb, Pie Dock, and Sour Dock.

3. **R. occidentàlis** Wats. WESTERN DOCK. Erect, glabrous, stout, and nearly simple, 3 to 6 ft. high; leaves somewhat fleshy, oblong-ovate or ovate-lanceolate, truncate or cordate at base, 6 to 16 in. long, the petioles of the basal leaves longer than the blade; panicle strict, mostly very dense, 1 to 2 ft. long, leafless or with a few small leaves below, rosy in fruit; pedicels 3 to 6 lines long, the joint below the middle obscure; inner fruiting sepals round-ovate, subcordate, naked, or rarely with a callous grain, 2 to 3 lines long.—Marshes in the valleys and marshy spots in the hills: San Francisco Bay region to Lassen Co. and Mt. Shasta; n. to Alas., e. to Lab. and Tex. Stems from a taproot, as also in nos. 4 to 8.

4. **R. crispus** L. CURLY DOCK. Stem stoutish, 1½ to 4 ft. high; leaves bluish-green, very wavy-margined, elliptical to oblong-lanceolate, 3 to 10 in. long, the petioles 1 or 2 in. long; flowering branches strict with few leaves, the whorls dense, mostly crowded and red-brown in fruit; pedicels twice as long as the fruit, tumidly jointed near the base; inner fruiting sepals broadly ovate, 2 to 2½ lines long, all with smooth callous grains, rarely 1 or 2 naked.—Very common weed in low and neglected lands in valleys and in the mts. to middle altitudes; nat. from Eur. The half-fleshy root has astringent and tonic properties. Blade more or less decurrent on the petiole, as in no. 6.

5. **R. berlandièri** Meisn. MEXICAN DOCK. Stem rather stout and succulent, simple, 1 to 2 ft. high, from a deep taproot; herbage not glaucous, darker green than in R. salicifolius; leaves linear to spatulate or narrowly oblong, 3 to 4 in. long, petioled; panicles leafless except for the main axis, the whorls dense, remote except above; pedicels prominently jointed below the middle; inner fruiting sepals ovate-triangular, erose or with 2 to 4 minute teeth on each side at base, 1½ to 2 lines long; callous grains mostly unequal, irregularly toothed on each side next to the sepal.—Colorado Desert; e. to Tex., s. to Mex.

6. **R. cónglomerâtus** Murr. GREEN DOCK. Stems slender, 3 to 5 ft. high, arising from a short mostly vertical rootstock which often crowns one or several fusiform roots; leaves ovate or mostly oblong, slightly undulate, 2 to 4 in. long, reduced above; flowering branches slender, erect, very long (⅓ to 1½ ft.), naked or with a lanceolate or ovate leaf subtending some or all of the remote whorls; pedicels as long as, or rather shorter than the fruit, tumidly jointed near the base and geniculate; fruit about 1 line long, the inner sepals oblong with callous grains mostly 3 and smooth.—Low moist valley lands throughout the state and in the mountains to middle altitudes; nat. from Eur.

7. **R. sálicifòlius** Weinm. WILLOW DOCK. Low spreading or erect, 1 to 2½ ft. high; leaves plane, glaucous, linear-oblong to oblong-lanceolate, acute at both ends, 4 to 6 in. long, short-petioled; flowering branches short (2 or less commonly 4 in. long), the lateral mostly divaricate; whorls dense, crowded, leafless, or 1 or 2 lower whorls remote and leafy; pedicels rather shorter than the fruit, jointed near the base and recurved but not geniculate; inner fruiting sepals triangular or triangular-ovate, pink-red, 1 to 2 lines long, the white callous grain only 1, or the grains 1, 2 or 3, even in the same panicle.—Wet places in valley lands and in the foothills, ascending to high altitudes in the mountains; distributed nearly throughout Cal., 20 to 6000 ft.; n. to B. C. Var. MONTIGÉNITUS Jepson. Flowering branches short and panicle more compact; inner fruiting sepals without callous grains or a calyx here and there with the grains subulate or small.—High montane (6000 to 11,000 ft.): Yollo Bolly Mts.; Sierra Nevada; s. to San Jacinto Mts.

8. **R. pùlcher** L. FIDDLE DOCK. Stem slender but rigid, widely parted into zigzag branches; leaves oblong or fiddle-shaped, 3 to 5½ in. long, petioled; flowering branches simple, divaricate, sparsely leafy, the dense whorls remote or at least distinct, red-brown in fruit; pedicels about equaling the fruit, tumidly jointed in the middle; inner fruiting sepals with 5 to 10 awn-like teeth on each side; callous grains 1 to 3.—Common weed of valley waysides and vacant lots in towns; also in meadows and moist places in the foothills and mts.: nat. from Eur.

9. **R. obtùsifòlius** L. BITTER DOCK. Tall, slender, 3 ft. high or more; leaves ovate-oblong to oblong-lanceolate, somewhat undulate, acute or obtuse, truncate or cordate at base, 6 in. long or less, long-petioled; flowering branches in a rather strict panicle, leafless or with a few little-reduced leaves at the base; whorls loose, not crowded, the lower remote; pedicels slender, 1 to 2 times as long as the fruit, tumidly jointed toward the base; inner fruiting sepals ovate-deltoid, 1½ to 3 lines long, with 3 to 5 thin triangular or subulate teeth on each side; grain 1 only or with 2 other small ones.—European weed in low lands about San Francisco Bay.

10. **R. persicárioides** L. GOLDEN DOCK. Stems soft and fistulous (at least below), prostrate or erect, seldom more than 1 ft. high; herbage yellowish green, minutely pubescent; leaves oblong or lanceolate, truncate or subcordate at base, acute at apex, a little undulate, 2 to 4 in. long, rather short-petioled; flowering branches with scattered subequal leaves, the whorls mostly crowded or the lower remote; pedicels very unequal, tumidly jointed at base; inner fruiting sepals ¾ to 1½ lines long, acutely produced at apex with 2 or 3 awn-like teeth on each side; callous grains 3; fruit almost bur-like.—Wet places by lakes or streams or in marshy lands: Los Angeles Co. to Alameda Co. and Siskiyou Co.; n. to B. C., e. to the Atlantic.

11. **R. paucifòlius** Nutt. Stems 9 to 15 in. high, in clusters from the crown of a taproot; leaves mostly basal, linear to narrowly ovate or oblong, entire, 1 to 3 in. long, drawn down to petioles 1 to 2 times as long; flowers on slender leafless branches; pedicels jointed toward the base; inner fruiting sepals round-cordate, finely reticulated, 1 to 1½ lines long, much longer than the achene.—Sierra Nevada, 3500 to 9500 ft.; n. to B. C., e. to Col.

12. **R. acètoséllа** L. SHEEP SORREL. Stems tufted, ½ to 2 ft. high, arising from running rootstocks; lower leaves hastate, the upper reduced or the branches leafless and ending in the reddish (pistillate) or yellowish (staminate) panicle; pedicels as long or twice as long as the flowers, not jointed; staminate flowers 1 line long or less, the pistillate rather smaller; achene granular.—Throughout the state, in places very common; nat. from Eur. The green leaves are very acid.

3. OXÝRIA Hill

Alpine perennial herb. Leaves somewhat fleshy, round-reniform, long-petioled, mostly basal. Stems erect, bearing a panicle of small green perfect flowers. Calyx of 4 nearly distinct sepals, the 2 inner erect (appressed in fruit), the 2 outer spreading. Stamens 6. Stigmas 2. Achene thin and compressed, surrounded by a broad wing and thus orbicular in outline. (Greek oxus, sour, on account of the acid leaves.)

1. **O. dígyna** (L.) Hill. MOUNTAIN SORREL. Stems simple, scape-like, 3 to 11 in. high, several from a large chaffy rootstock; flowers on slender pedicels; achene 1½ lines in diameter, very much larger than the sepals, entire or emarginate at each end.—Alpine, among cold wet rocks, 8000 to 12,000 ft.: Sierra Nevada, s. to Mt. San Jacinto and n. to Mt. Shasta and Warner Mts.; n. to the arctic circle and around the northern hemisphere.

4. PTEROSTÈGIA F. & M.

Annuals with very slender and weak stems and opposite leaves. Flowers solitary and nearly sessile in the axils, longer than the subtending bract. Bract rounded and more or less 2-lobed, dentate on the margin, in fruit

enlarged, scarious and reticulated, loosely inclosing the achene and developing 2 sac-like protuberances on the back. Calyx 6 (or 5)-parted; stamens as many or fewer than the lobes. (Greek pteron, a wing, and stege, a covering, in reference to the bract.)

1. **P. drymàrioìdes** F. & M. Stems commonly several from the base, usually with a branch at each node, diffuse or straggling, a few inches to 1¼ ft. long; leaves roundish or broader than long and notched once or twice at apex or even cleft, or distinctly fan-shaped or obcordate, 2 to 6 (or 10) lines broad, narrowed at base to a slender but mostly short petiole; flowers reddish, less than 1 line long; calyx-segments oblong-lanceolate.—Foothills, under trees in open woods, or in the shade of rock outcroppings, throughout Cal.: n. to Ore., s. to L. Cal. Apr.-May.

5. **PHYLLÓGONUM** Cov.

Prostrate annual with the leaves basal and in 3s at the nodes. Flowers yellow, pediceled, borne in close fascicles at the nodes, without involucre or bracts. Calyx deeply cleft into 6 divisions. Stamens 9. (Greek phullon, leaf, and gonu, knee, on account of the leafy, not bracteate, nodes.)

1. **P. lutèolum** Cov. Stems several from the base, 3 to 5 in. long with 3 to 5 branches at the nodes; herbage yellowish, nearly glabrous; leaves obovate, drawn down to a petiole; calyx ¾ to 1 line long.—Death Valley region.

6. **NEMACAÚLIS** Nutt.

Annual with very slender stems and mostly basal white-woolly leaves. Flowers crowded in subglobose heads; heads sessile in the forks and along the branches, each flower subtended by an herbaceous bract. Calyx 6-cleft. Stamens 3. Achene short-ovoid. (Greek nema, thread, and kaulos, stem, referring to the slender stems.)

1. **N. denudàta** Nutt. Stems prostrate or ascending, 6 to 14 in. long, glabrate, reddish; leaves spatulate, narrowed to a petiolar base, ½ to 1½ in. long; bracts oblong, forming a whorl at the nodes; bracts of the flower-clusters obovate, 1 line long, glabrous below, white-woolly above, the outer flowerless, the inner smaller; flowers yellowish, glabrous, ½ line long.—Sea-beaches, sand-dunes and sandy soil: San Pedro to San Diego; w. edge of the Colorado Desert; L. Cal.

7. **HOLLISTÈRIA** S. Wats.

White-woolly annual herbs. Leaves alternate, cuspidate, with a small lanceolate pair at base like stipules. Involucres solitary and sessile in the axils, composed of 3 almost distinct linear bracts, 2-flowered. Flowers unequally pediceled, with a minute scarious bractlet at base. Calyx 6-cleft to the middle. Stamens 5 to 9, included. Achene glabrous. (Col. W. W. Hollister, pioneer Californian.)

1. **H. lanàta** Wats. Stems several or many from the base, prostrate, 3 to 7 in. long; basal and lowest stem leaves oblanceolate, narrowed to a petiole, 1 to 1¾ in. long, glabrate; stem leaves ovate, sessile, cuspidate, 3 to 7 lines long, white-woolly; calyx 1 line long, very woolly outside, its lanceolate lobes green with a scarious margin.—S. Monterey Co. e. to the upper San Joaquin Valley.

8. **LASTÁRRIAÈA** Remy.

Small fragile annual, diffusely branched from the base. Leaves linear, in a basal tuft and in whorls along the stem, the upper ones and the bracts with hooked awns. Flowers solitary, sessile in the forks and terminal, concealed by the involucre-like whorl of bracts. Calyx simulating an involucre, tubular, 5 to 6-cleft, the teeth with hooked awns. Stamens 3, inserted on the throat, the filaments with a small membranous tooth on each side. (J. V. Lastarria, 1817-1888, Chilean publicist and writer.)

1. **L. chilénsis** Remy. Stems 2 to 10 in. long; herbage slightly hairy; floral bracts crowding the ends of the branchlets, scattered below; calyx 1 to 2 lines long.—Dry sandy soil: Contra Costa and Monterey Cos. to S. Cal., thence n. to Mono Co.; L. Cal.; nat. from Chile. May-June.

9. CHORIZÁNTHE R. Br.

Low dichotomously branched annual herbs of summer. Leaves mostly in a basal rosette which disappears early in the dry season, the cauline leaves commonly reduced to opposite, ternate or unilateral bracts. Involucres commonly 1, sometimes 2 to 6-flowered, cylindric, urnshaped or triangular, always sessile, mostly 3 to 6-angled or -costate, 3 to 6-toothed or -cleft; teeth divaricate, cuspidate or awned, the awns commonly with a hooked tip. Flowers pediceled or nearly sessile, without bractlets, included within the involucre or the calyx protruding. Calyx 6-parted or -cleft, colored, never herbaceous. Stamens usually 9, 6 or 3. Ovary glabrous. Our species are of the deserts or arid foothills. (Greek chorizo, to divide, and anthos, flower, on account of the parted calyx.)

A. Bracts entire.

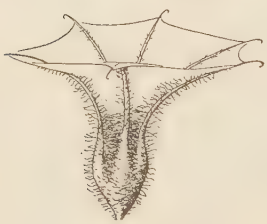
Involucres urnshaped or the tube cylindric and slightly contracted below the teeth; teeth equal or the 3 alternate shorter, bordered by a scarious membrane; stamens 6 or 9, inserted at base or lower part of calyx-tube.
- Involucre bordered by a broad membrane, the teeth excurrent from it.
  - Membrane white, the 6 involucral teeth equal....1. *C. membranacea.*
  - Membrane purple, 3 of the involucral teeth usually inconspicuous or minute....2. *C. nortonii.*
- Involucral teeth bordered by a narrow membrane but distinct.
  - Calyx-lobes bifid, erect; Sierra foothills....3. *C. stellulata.*
  - Calyx-lobes not bifid; Coast Ranges along the coast.
    - Membrane of involucral lobes not continuous around sinuses.
      - Mostly prostrate or diffuse; heads scattered at intervals along the stems on short peduncles; involucral lobes with moderate scarious borders....4. *C. pungens.*
      - Erect; heads mostly terminal on the cymose forks; involucral lobes with showy white borders....5. *C. nivea.*
    - Membrane of involucral lobes continuous around sinuses; erect....6. *C. douglasii.*

Involucres cylindric (except nos. 18 and 19), not scarious margined, the teeth 6, sometimes 5, 4, or 3.
- Involucral tube cylindric, usually 6-ribbed; stamens 3, 6 or 9, inserted at base or lower part of calyx-tube.
  - Plants commonly but not always erect.
    - Joints excessively fragile; calyx-lobes equal; plant yellowish.7. *C. brevicornu.*
    - Joints less fragile.
      - Calyx-lobes not fringed.
        - Calyx-lobes entire; plant reddish.
          - Calyx-lobes equal; rare....8. *C. breweri.*
          - Calyx-lobes unequal; common....9. *C. staticoides.*
        - Calyx-lobes erosulate, very unequal....10. *C. valida.*
      - Calyx-lobes, at least the inner, fringed.
        - Lobes very unequal, the inner fringed....11. *C. palmeri.*
        - Lobes equal, all fringed....12. *C. fimbriata.*
  - Plants prostrate or procumbently spreading.
    - Involucral teeth subequal or 3 long and 3 short; coastal S. Cal.
      - Plants low, spreading horizontally; flowers white....13. *C. parryi.*
      - Plants procumbent; flowers yellow....14. *C. procumbens.*
    - Involucral teeth very unequal.
      - Involucre 6-ribbed.
        - One tooth very long and 5 very short; stamens 6 or 9....15. *C. uniaristata.*
        - Teeth very unequal; stamens 3....16. *C. clevelandii.*
      - Involucre 4 or 5-ribbed; stamens 9....17. *C. spinosa.*
- Involucral tube 3-angled, or cylindric but not ribbed or angled, in either case usually transversely corrugated; calyx tubular, shortly 6-cleft; stamens 6 or 9, inserted on the calyx-throat.
  - Involucral tube 3-angled, its teeth stout, divergent.
    - Teeth equal or in equal sets.
      - Teeth 3; cauline leaves usually none....18. *C. orcuttiana.*
      - Teeth 6, the alternate 3 very short and inconspicuous; cauline leaves in pairs....19. *C. polygonoides.*
    - Teeth 3, very unequal, foliaceous, ovate to lanceolate; very spiny....20. *C. rigida.*
  - Involucral tube cylindric, not ribbed or angled.
    - Involucral lobes 3, equal, the tube strongly corrugated....21. *C. corrugata.*
    - Involucral teeth or lobes 5, one foliaceous and much larger than the other 4, the tube obscurely corrugated....22. *C. watsonii.*

B. Bracts 3-lobed.

Involucre without spurs, sometimes the angles gibbous at base.
Involucres 4-angled, 4-toothed.
Bracts minute; involucral teeth equal.....23. *C. vortriedei.*
Bracts very conspicuous and foliaceous, orbicular-perfoliate; teeth unequal.....
24. *C. perfoliata.*
Involucres cylindric, not 4-angled.
Involucral tube smooth, its teeth 3, unequal; bracts unilateral, 3-lobed, foliaceous and conspicuous.....25. *C. californica.*
Involucral tube sulcate, its teeth 5, equal; bracts small.....26. *C. insignis.*
Involucre with spurs at base.
Spurs 6, spine-like; involucral teeth uncinate.....27. *C. leptoceras.*
Spurs 3, saccate, each about as large as involucral tube; involucral teeth straight....
28. *C. thurberi.*

1. **C. membranàcea** Benth. Fig. 316. Erect, ½ to 1½ ft. high, mostly simple below, once to thrice dichotomous above, the involucres in solitary capitate clusters along the branches or mostly terminal; herbage lanate, floccose in age, the upper surface of the leaves glabrate; leaves linear, sessile, or gradually narrowed into a short petiole, ½ to 1¼ in. long; involucres urnshaped, 1½ to 2 lines long, wholly white-scarious between the awned teeth, or some involucres, especially solitary ones in the lower forks, wholly destitute of membranous border; awns slender, uncinate, and strongly divergent; flowers 2 or 3, unequally pediceled, of these 1 or 2 undeveloped or obsolete; calyx woolly, its segments obovate or spatulate, the inner narrower, all clawed, united only at very base; stamens 9.—Foothills, mostly towards the interior, 250 to 4500 ft.: Monterey Co. to Tehama Co.; Sierra Nevada. May-June.



316. Chorizanthe membranacea Benth.; involucre x 5.

2. **C. nortònii** Greene. Fig. 317. Mostly 1-stemmed, 2 or 3-forked, or sometimes many-stemmed from base, 4 to 7 in. high, the involucres congested in terminal heads; leaves oblanceolate, 1 to 1¾ in. long; lower bracts foliaceous, the upper reduced; herbage hairy; involucres reddish, cylindric-urnshaped, 6-ribbed, margined by a broad scarious purple 6-lobed border; lobes unequal, the 3 larger triangular in outline, the 3 alternate often small or obsolete, all ending in a short uncinate awn; some earlier involucres solitary in the forks and these destitute of scarious margin; calyx rose-color, little exserted, its short oblong lobes equal, undulate-erosulate; stamens 6 or 9.—Mts. bounding the Salinas Valley, Monterey Co. June. Involucres often reticulate between the ribs.

317. Chorizanthe nortonii Greene; involucre x 5.

3. **C. stellulàta** Benth. Stem erect, trichotomously branched, mostly above the base, 4 to 6 in. high, the involucres in cymose clusters or somewhat capitate; herbage hairy; leaves linear, acute, sessile, 5 to 8 lines long, in a rosette at base and in whorls at the nodes or reduced above; involucres cylindric-urnshaped, 6-ribbed, 2 lines long, reticulate between the ribs; involucral teeth 6, nearly equal, with scarious margins, the tips uncinate or straight; calyx-lobes bifid or usually so.—Sierra Nevada foothills from Shasta Co. to Tulare Co.

318. Chorizanthe pungens Benth.; involucre x 5.

4. **C. púngens** Benth. Fig. 318. Stems prostrate or at first erect, more or less dichotomous, 2 to 15 in. long, the involucres in head-like clusters on very short lateral branchlets or terminal; herbage villous pubescent; leaves basal and in pairs at the lower nodes, spatulate or oblanceolate, narrowed to a petiole, ½ to 2 (or 4) in. long, reduced above to bracts; involucres cylindric-urnshaped, hairy, 1 to 1½ lines long, subtended by subulate or acicular pungent bracts;

involucral tube sharply 6-angled or -ribbed, unequally 6-toothed, the alternate teeth shorter, all uncinate and more or less scarious-margined towards the base; calyx white, its lobes equal, oblong, erose-denticulate, hairy on the outside; stamens 9 or 6.—Sand-dunes and sandy valleys along the coast from Marin Co. to Santa Barbara Co. Var. DIFFÙSA Parry. Leaves all basal; scarious border of the involucral teeth pink.—Valleys, Santa Cruz to Montery. Var. CUSPIDÀTA Parry. Involucral teeth without scarious margins or the margins scant, otherwise identical with the species.—San Francisco Co. to Sonoma Co. Var. ROBÚSTA Jepson. Stems erect, branched above, ½ to 2 ft. high; heads large, dense, mostly terminal or subterminal; involucral teeth with narrow margins or none.—San Francisco Bay region to Monterey Bay.

5. **C. nívea** Jepson. Erect; head-like clusters borne on dichotomous cymes; all the involucral teeth with scarious white margins, the alternate teeth smaller; calyx white, its lobes with yellow tips.—Mts. near San Luis Obispo; Monterey.

6. **C. douglásii** Benth. Stem erect, tri- or di-chotomously branching, 4 to 6 in. high; basal leaves spatulate, shortly petioled, the cauline oblong to linear; bracts subulate; herbage somewhat hairy pubescent; involucres hairy, condensed in terminal heads, urnshaped-cylindric, 1½ lines long, sharply ribbed, reticulate between the ribs; involucral teeth spreading, membranous margined below the short hooked awn, the membrane continuous in the sinus between the teeth; calyx rather deeply cleft, its lobes equal, oblong-ovate, obtuse, erosulate.—Monterey Co.

7. **C. brevicórnu** Torr. Fig. 319. Stems several from the base, erect, repeatedly and shortly dichotomous, yellowish, 3 to 8 in. high, excessively fragile; herbage minutely pubescent; leaves in a basal tuft, linear-oblanceolate, narrowed to a petiole, ½ to 2 in. long; involucres in the forks and along the branchlets, 1-flowered, cylindric, 2 to 2½ lines long, acutely 3-angled or 3-ribbed, with 3 smaller ribs between, minutely corrugated between the ribs; teeth 6, hooked, the 3 alternate smaller; flowers white, glabrous, sessile; calyx-tube long and slender, its lobes oblong, nearly equal, truncatish and erosulate at apex, barely exserted; stamens 3, at base.—Arid stony hills, Colorado and Mohave deserts n. to Inyo Co.; e. to Nev. and Ariz. More fragile than any other species, the specimens usually disjointing completely when dry.

319. Chorizanthe brevicornu Torr. involucre x 5.

8. **C. bréweri** Wats. Similar to C. staticoides but more diffuse; herbage canescent but reddish; involucres acutely 6-ribbed and reticulated, constricted a little below the spreading teeth, the alternate teeth somewhat smaller; calyx white, exserted, its lobes oblong to elliptic, obtuse, entire, subequal, at least when fully developed. — Hillsides, San Luis Obispo Co.

9. **C. státicoides** Benth. TURK'S RUG. Stems 1 or several from the base, erect or ascending, cymosely dichotomous, 4 to 10 (or 18) in. high, fragile at the joints; involucres sessile, congested at the end of the branchlets or solitary in the forks; herbage characteristically reddish, soft-pubescent or grayish, in age subglabrate, the under surface of the leaves white-woolly; leaves obovate to elliptic, 3 to 9 lines long, the petioles 1 to 3 times as long; involucres cylindric, 6-ribbed, 2 to 2½ lines long, the teeth spreading, hooked at tip, 3 much larger than the 3 alternate or the latter obsolete; calyx white, rose-pink or deep rose, exserted, the segments narrowly oblong, mostly entire, hairy on the back, the inner smaller and shorter; stamens 9 or 6.—Dry sandy plains and foothills: coastal S. Cal. to Monterey Co., thence e. to the upper San Joaquin Valley. Not known in the Mohave or Colorado deserts. Var. NUDICÁULIS Jepson. Herbage commonly greenish; flowers white. —Mt. slopes along the coast from Santa Barbara to Echo Mt.

10. **C. válida** Wats. Erect, 4 to 6 in. high, once or twice di- or tri-chotomously branched; leaves spatulate; involucral teeth or lobes not margined but awned; awns mostly straight; inflorescence similar to the preceding:

flowers pedicellate, partly exserted; calyx-segments oblong, erose-denticulate, hirsute along the back on the midvein, very unequal (the alternate only ½ as long).—Sonoma Co.

11. **C. pálmeri** Wats. Stem erect (or sometimes prostrate), trichotomous, 5 to 12 in. high, the ends of the simple or dichotomous branches bearing head-like clusters of erect compactly crowded involucres, the forks usually with solitary involucres; herbage pubescent; leaves in a basal tuft, oblong-spatulate, ½ to 1¼ in. long; bracts of the flower clusters setaceous; involucres cylindric or a little contracted upward, 1½ to 2 lines long, 6-ribbed, 6-toothed, the larger 3 unequal, the smaller 3 nearly equal, all tipped with mostly straight spines; flowers rose-color, exserted, very shortly pedicelled; calyx shortly cleft, the outer lobes roundish, entire, the inner shorter, shortly laciniate-fringed; stamens 9.—Dry hills, Monterey and San Luis Obispo Cos.

12. **C. fimbriàta** Nutt. Stem erect or diffuse, trichotomous at first node, then dichotomously branching, 4 to 10 (or 15) in. high, the involucres solitary in the forks or clustered along the terminal branchlets; herbage reddish, lightly pubescent; leaves basal, spatulate or obovate, narrowed to a petiole, 1 to 2 in. long; bracts subulate or acicular; involucres cylindrical, 2 to 3 lines long, 6-ribbed, ending in 6 spreading spine-tipped teeth, the alternate teeth smaller; teeth uncinate (or straight); calyx white, exserted, its lobes ovate-lanceolate, equal, irregularly fringed on each side, mostly below the middle; stamens 6.—Palm Sprs.; Mt. San Jacinto; San Diego Co. May-July. Var. LACINIÀTA Jepson. Habit, foliage, involucres and pubescence that of the species; calyx rose-color, its lobes laciniate-fringed throughout. —San Diego Co.

13. **C. párryi** Wats. Stems several from the base, spreading horizontally and repeatedly forking, forming low flat-topped plants 3 to 15 in. broad, the involucres clustered at the ends of the branchlets; leaves oblong, narrowed to a short petiole, 4 to 9 lines long; involucres 1 line long, cylindric but somewhat contracted below the spreading teeth, the tube acutely 6-angled; teeth uncinate, 3 large alternating with 3 small; calyx white, its segments erosulate, the inner half as large as the outer; stamens 9.—Sandy or gravelly plains, San Bernardino Valley. Var. FERNANDÌNA Jepson n. comb. Stems longer and laxer; awns of the involucre (or some of them) straight; calyx lobes nearly equal, the inner narrower.—Washes, Los Angeles to San Fernando Valley. (C. fernandina Wats.)

14. **C. procúmbens** Nutt. Stems procumbent, several from the base, elongated and sparingly branched, 3 to 13 in. long, the involucres in small clusters along and towards the ends of the branchlets; herbage soft-pubescent; leaves spatulate or oblanceolate, in a basal tuft and at the lower nodes; bracts lanceolate; involucres 6-ribbed, with mostly 6 equal spreading teeth, or the 3 alternate shorter; calyx yellow, the inner lobes much smaller than the outer.—Coastal S. Cal.

15. **C. uniáristàta** T. & G. Stems prostrate, 2 to 6 in. long, with a short soft pubescence; leaves broadly spatulate, the bracts oblanceolate and cuspidate or nearly acicular towards ends of branches; involucres numerous and rather loosely cymose on the branches or sometimes densely clustered, cylindric-urnshaped, 6-ribbed, 1½ to 2 lines long; involucral teeth awned, one awn long and straight, the others very short and hooked; flowers cream-color; outer calyx-lobes obovate, entire, the inner half as long, oblong, crenate; stamens 6 or 9.—Foothills, Mt. Diablo to San Luis Obispo Co., thence e. to the Sierra Nevada in Kern Co.

16. **C. clevelándii** Parry. Stems prostrate, branched from the base, 4 to 10 in. long; herbage hairy pubescent; basal leaves ovate-spatulate, cauline leaves narrow and pungent; involucre 6-ribbed, with unequal divergent uncinate teeth; outer calyx-lobes broadly oblong, truncate, erosulate or denticulate, the inner about half as long as the outer; stamens 3.—Region of Clear Lake. Closely allied to C. uniaristata.

17. **C. spinòsa** Wats. Stems several from the base, prostrate, forming a loose spiny mat 8 to 16 in. broad; herbage puberulent; basal leaves oval or

obovate, narrowed to a petiole with a broad or clasping base; bracts lanceolate, setaceous, conspicuous, their axils bearing clusters of 3 or 4 involucres; involucres short-cylindric, 4 or 5-costate, the teeth very unequal, usually with 1 long tooth, 1 or 2 minute ones and 1 or 2 of intermediate size, all straight-awned; flowers 2 or 3, pediceled, usually only 1 developed; calyx white, the 3 outer lobes orbicular with a short narrow claw, the 3 inner ovate, smaller, minute; stamens 9.—Mohave Desert, Muroc Sta.

18. **C. orcuttiàna** Parry. Stems several from the base, prostrate, 1 to 4 in. long, sparingly dichotomous; herbage thinly pubescent; leaves spatulate or narrowly oblanceolate, mostly in a basal tuft; involucres scattered along the branches and terminal; involucral tube nearly 1 line long, cylindric but 3-angled, 3-toothed, not or only obscurely reticulated, its stout teeth nearly or quite horizontally spreading and as long as the tube; flowers usually 1, pediceled; "calyx-lobes equal, its tube narrowly turbinate; stamens 9 or fewer."—Point Loma, San Diego. Quite like C. polygonoides in habit but its involucres very different.

19. **C. polýgonoìdes** T. &. G. Dichotomously branched, forming mats 5 to 10 in. across; basal leaves oblanceolate, contracted to a petiole, ¾ to 1½ in. long; bracts in pairs, oblanceolate or obovate, resembling the leaves of the basal rosette and becoming smaller towards the ends of the branches; involucres obpyramidal, strongly 3-angled, corrugated between the ribs, without scarious margin, solitary or in 2s or 3s, the tube 1 to 1½ lines long, the 3 larger lobes as long and with alternating short and inconspicuous ones at base.—Widely but sparsely scattered from Modoc Co. to San Diego Co.

20. **C. rígida** T. & G. Stem erect, 1 to 3 in. high, simple or very shortly branched, densely packed with short involucre-bearing branchlets, or sometimes diffusely spreading and forming a spiny mat 6 to 11 in. broad; leaves on the primary stem or branches round-ovate to obovate, 4 to 12 lines long, on petioles 1 to 1½ times as long, those of the branchlets lanceolate or subulate, spine-tipped, becoming hard and rigid, the involucres in clusters in their axils; involucral tube short, about 1 line long and as broad, strongly and acutely 3-angled and strongly reticulated between the angles, its lobes 3, foliaceous, ovate to lanceolate, spreading, unequal, 3-ribbed and reticulate on back, spine-tipped, 1 to 8 lines long; flower pediceled, yellowish; calyx-tube narrow, abruptly expanded into the short throat and limb, its lobes oblong, short, very hairy on back, scarcely exserted; stamens 9, inserted at throat.—Arid rocky hills: Colorado Desert; e. Mohave Desert; Inyo Co.; s. Nev. to Ariz. and L. Cal. Apr.-May. One of the most characteristic desert annuals on the driest stony hills where there is little or no other vegetation.

21. **C. corrugàta** (Torr.) T. & G. Fig. 320. Stems several from the base, erect or ascending, 1 to 4 in. high, slightly villous; leaves roundish ovate, woolly or glabrate above, 2 to 9 lines long, on slender petioles; bracts subulate, small; involucres solitary in the forks and along the branches but numerous; involucral tube cylindrical, not angled or ridged but strongly corrugated, 1 to 1½ lines long; involucral lobes 3, equal, ovate, as long as the tube, woolly above, reticulate below, short-awned, uncinate; calyx white, included; "stamens 6 or 9, on middle of tube."—E. Mohave Desert; Colorado Desert; L. Cal.

320. Chorizanthe corrugata T. & .G.; involucre x 6.

22. **C. watsònii** T. & G. Stems erect or ascending, several from the base, dichotomous, 1 to 4 in. high; herbage canescent; leaves basal, narrowly oblanceolate; bracts in pairs, at length setaceous; involucres solitary in the forks and clustered towards the ends of the branchlets, canescent; involucral tube slender cylindric, not ribbed, obscurely corrugated, 2 to 3 lines long, its teeth 5, one foliaceous and usually much larger than the other four, especially on involucres solitary in the forks; flower pediceled, included; calyx yellow, hairy externally; stamens 9, inserted at mouth of tube.—Santa Ana Cañon, San Bernardino Mts. (F. W. Peirson);

Mohave Desert, n. to Inyo and Lassen Cos.; Nev. to Wash. Foliaceous lobe of the involucre 3 to 4 lines long.

23. **C. vortrièdei** Bdg. Stem divaricately trichotomous at the first node, then dichotomous, 4 to 7 in. long, the internodes relatively long and the involucres solitary in the forks; herbage glabrous or a little glandular; leaves in a basal rosette, spatulate, ¼ to 1 in. long; bracts small, perfoliate, 3 (or 4) -lobed, the lobes triangular or oblong; involucres 1½ lines long, the tube 4-sided or 4-angled, the angles at base somewhat gibbous or ridge-like; involucral teeth 4, short, ovate or triangular, cuspidate; flowers 2, long-pediceled; calyx yellowish-green, 5-cleft, each short yellowish division bearing two white oblong lobes; stamens 9, inserted at base; seed black, globose, apiculate.—Local species, s. Santa Lucia Mts. In aspect it suggests a starved form of C. perfoliata, but it is a distinctive species, particularly in its peculiar calyx.

24. **C. perfoliàta** Gray. Stem branching at or near the base, diffuse with numerous branchlets, 8 to 13 in. high; leaves spatulate, 1 to 2 in. long; herbage sparingly pubescent or a little glandular; bracts perfoliate, orbicular or 3-lobed, spine-tipped at the angles; involucres strongly and acutely 4-angled, 2 or in age 3 or 4 lines long, mostly one at each node, wrinkled between the ribs, the 4 divergent teeth spine-tipped; angles or ribs sometimes swollen into a small gibbous projection at base; calyx pediceled; stamens 6.—Mt. Hamilton Range to the head of the San Joaquin Valley and the central Mohave Desert. In habit remarkably similar to C. californica.

25. **C. califórnica** (Benth.) Gray. Stem branching at or near the base, rather sparingly forked into slender spreading branches, 4 to 14 in. high; herbage glandular hirsute; basal leaves ovate or broadly oblanceolate, narrowed to a short petiole, ¾ to 1¼ in. long; bracts broader than long, divergently 3-lobed, the lobes spine-tipped, 4 to 8 lines long; involucres in 3s at each node, 1-flowered, 1½ to 2 lines long, subcylindric, not ribbed, smooth (but more or less hairy), with stout spreading spine-tipped teeth; teeth mostly 3, unequal, sometimes with 4 in 2 unequal pairs or only 2; calyx white, the tube slender, a little exserted in anthesis, its lobes broadly oblong, very obtuse.—San Luis Obispo Co. to San Diego Co., mainly near the coast. Var. SUKSDÓRFII Mcbr. Bracts very large; involucral tube urceolate, somewhat angular.—Sand-dunes, Surf, Santa Barbara Co.

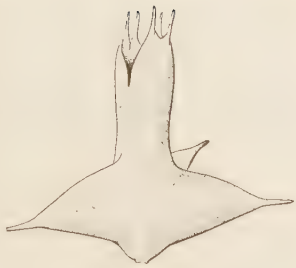
26. **C. insígnis** Curran. Stem erect, divergently dichotomous, glandular, reddish, 3 to 4 in. high, the involucres solitary and secund along the branches; leaves in a basal tuft, linear-spatulate, glabrous, 3 to 6 lines long; bracts 3-lobed, the lobes oblong, those of the upper ones lanceolate-setaceous; involucres cylindric or obconic, slightly corrugate, lightly 5-sulcate, 1½ lines long, armed with 5 horizontally divergent spines; spines equal, straight, as long as the involucral tube; flowers 4 to 6 in each involucre, pediceled; calyx rose-color, hairy, exserted; "stamens 9."—Central Monterey Co.

321. Chorizanthe leptoceras Wats.; involucre x 6.

27. **C. leptóceras** (Gray) Wats. Fig. 321. Stems 2 or 3 from the base, very slender, divaricately dichotomous, 3 to 11 in. long; herbage glabrous except a little pubescence on the bracts and involucres; leaves basal, oblanceolate, ½ to 1 in. long; bracts 3-lobed, 1½ to 2½ lines broad; involucres in capitate clusters in the forks and terminal on the branchlets, the proper tube short, soon flaring into 6 lanceolate long-awned ciliate teeth and armed at base with 6 uncinate spine-like spurs; flowers 2 or 3; calyx campanulate, its spatulate lobes almost distinct; stamens 6.—Dry sandy plains, s. bases of the San Gabriel and San Bernardino mountains.

28. **C. thúrberi** (Gray) Wats. Fig. 322. Stems 1 or several from the base, di- or tri-chotomously forking, 2 to 8 in. high; herbage glandular-hispidulose near the base, sparingly so above; leaves in a basal rosette, elliptic to oblong,

3 to 4 lines long; bracts small, 3-lobed and spine-tipped; involucres chartaceous, 2-flowered, solitary in the axils of the bracts, 2 lines long, cylindric, 5-toothed and 3-horned; teeth erect, tipped with a short straight spine; horns near base saccate, spreading, short, thick, each tipped with a short straight spine; flowers pedicelled; calyx deeply parted, hairy on the outside; stamens 9 or 6.—Arid valleys, Colorado and Mohave deserts to Inyo Co.; s. Sierra Nevada; San Carlos Range; s. Nev. and Ariz.



322. Chorizanthe thurberi Wats.; involucre x 6.

10. **OXYTHÈCA** Nutt.

Slender annuals with the internodes more or less covered with stipitate glands and a repeatedly dichotomous inflorescence. Leaves in a rosette at base. Bracts more or less connate, often in 3s. Involucres 2 to several-flowered, more or less pedicellate, mostly turbinate, 4 or 5-cleft, each lobe bearing a bristle or awn. Flowers mostly exserted. Calyx glandular or pubescent on the outside. Stamens 9. Achene commonly lenticular. (Greek oxus, sharp, and theke, case, in allusion to the spiny involucre.)

Involucres lobed.
- Involucres 5-lobed; bracts united only at base.
  - Involucres deeply parted into linear to obovate lobes.
    - Plants prostrate; involucres sessile ..... 1. *O. luteola.*
    - Plants erect; involucres pediceled.
      - Calyx-lobes entire ..... 2. *O. caryophylloides.*
      - Calyx-lobes cleft ..... 3. *O. trilobata.*
  - Involucre a shallowly-lobed concave disk; calyx-lobes fimbriate .. 4. *O. emarginata.*
- Involucres acutely 4-lobed; plants erect.
  - Bracts completely united into a round concave perfoliate disk; involucres sessile or nearly so ..... 5. *O. perfoliata.*
  - Bracts united only at base; involucres mostly pediceled.
    - Leaves revolute ..... 6. *O. dendroidea.*
    - Leaves plane ..... 7. *O. watsonii.*

Involucral tube short, not lobed, its margin with 14 to 36 bristles ..... 8. *O. varishii.*

1. **O. lutèola** Parry. Stems prostrate, several from the base, branching, 2 to 5 in. long; herbage usually yellowish; leaves basal and in pairs at the lower nodes, rounded, 1 to 2 lines long, the petioles mostly longer; bracts linear, acerose, in 2s or 3s; involucres in the forks and along the branchlets, parted almost to the base into 5 unequal divisions, the divisions linear, acerose or bristle-tipped, 1 to 3 lines long; flowers 7 to 11; calyx-tube subglobose, woolly, the glabrous yellow lobes spreading from its orifice.—Local species, Lancaster, Mohave Desert.

2. **O. caryophýlloìdes** Parry. Stem erect but diffusely branching above the base, 7 to 10 in. high, the involucres numerous along the branchlets and terminal, on pedicels 1 to 4 lines long; herbage glabrous or nearly so; leaves basal, obovate to oblong-spatulate, contracted to a petiole, ¾ to 2 in. long; bracts foliaceous, 3-parted into oblong divisions; involucres deeply parted into 5 nearly equal divisions, the divisions oblong, or a little widened upward, and abruptly awned; flowers 2 or 3; calyx short, greenish, obscurely lobed.—San Antonio, San Bernardino and San Jacinto mountains, 4000 to 7000 ft.

3. **O. trilobàta** Gray. Stems one, sometimes several from the base, once trichotomous, then dichotomous, 4 to 14 in. high, the branches spreading; leaves in a basal tuft, spatulate, ⅓ to 2 in. long, a little hairy; herbage sparingly glandular; bracts 3-lobed, the lobes acerose; involucres glabrous, glaucous, deeply 5-parted, borne on slender pedicels; pedicels solitary in the forks and axils of the bracts; involucre deeply lobed, 2 to 3 lines long, its lobes oblong or spatulate, tipped with a bristle; calyx segments 3-cleft into lanceolate acuminate lobes slightly erosulate on the sides.—Dry valleys: San Bernardino Valley to San Diego Co.

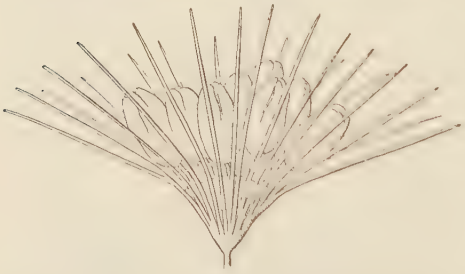
4. **O. emarginàta** Hall. Stem erect, tri- and di-chotomous, 2 to 6 in. high, the involucres in the forks and terminal on pedicels 1 to 6 lines long; herbage reddish, sparingly and minutely glandular; leaves in a basal rosette, oblanceolate, 4 to 8 lines long; bracts mostly 3-lobed; involucres obpyramidal, 2 to 3 lines high, shallowly 5-lobed, the lobes rounded, scarious-margined, awn-tipped; flowers 4; calyx 6-parted, its segments oblanceolate, fimbriate at apex.—Ridges about Tahquitz Peak, San Jacinto Mts. July.

5. **O. perfoliàta** T. & G. Stem erect but short, parting at the first node into 2 or 3 horizontally spreading branches 2 to 4 in. long; herbage slate-color or reddish, glabrous except a glandular band on lower half of internodes; leaves of the basal rosette oblong-oblanceolate, green, 6 to 12 lines long; bracts at first node 3 or 4, small, united only at base, the upper bracts very conspicuous, orbicular- or deltoid-perfoliate, spine-tipped at the angles, 4 to 9 lines broad, glaucous; involucre narrowly turbinate, 3 to 4 lines long, deeply and acutely 4-lobed, each lobe bristle-tipped; calyx whitish, ⅔ line long, the outer segments minutely white-scaly.—Mohave Desert, n. to Lassen Co.; Nev. to Ariz.

6. **O. déndroídea** Nutt. Stem erect, tri- and di-chotomously branching above the base, 7 to 14 in. high, hispidulose-glandular, the involucres nearly sessile or shortly pediceled along the branchlets, or those in the forks mostly on pedicels 1 to 4 lines long; leaves linear to oblanceolate, revolute, acute, thinly hirsute, ¾ to 1½ in. long; involucres narrowly turbinate, ½ to 2 lines long, 4-lobed, the lobes with very unequal awns or sometimes the awns obsolete; flowers about 3; calyx pale rose or whitish, rough pubescent, very shortly lobed.—Crooked Creek, Owens Valley; Lassen Co.; n. to Wash., e. to Wyo.

7. **O. watsònii** T. & G. Stem erect, dichotomously branching above the base, 6 to 9 in. high, glaucous; leaves spatulate, ½ to 1 in. long; bracts awned, reflexed; involucres turbinate, 4-lobed, with elongated awns, 1½ lines long, borne on pedicels 2 to 5 lines long; flowers ½ line long, white, puberulent.—Cushenbury Sprs., Mohave Desert; e. to Nev.

8. **O. paríshii** Parry. Fig. 323. Stem erect, diffusely but sparingly tri- and di-chotomous above the base, 8 to 14 in. high, glabrous and glaucous except a hispidulose-glandular band on the lower part of the internodes and on the pedicels; leaves basal, spatulate-obovate, ½ to 1¼ in. long; bracts small, 3-cleft; involucres on axillary and terminal pedicels (¼ to 1¼ in. long), the tube turbinate, short (1 line long), but developing from its margin a circle of 14 to 36 excurrent bristles 2 to 3 lines long; flowers 5 to 14, pediceled; calyx 6-cleft nearly to base, its lobes linear-oblong, almost distinct, pubescent on back; stamens 9.—Montane 4500 to 6500 ft.: San Gabriel and San Bernardino mountains; n. to Mt. Pinos.



323. Oxytheca parishii Parry; involucre x 5.

11. ERIÓGONUM Michx.

Annual or perennial herbs or small shrubs with basal or alternate or whorled leaves without stipules, those of the inflorescence commonly reduced to bracts. Flowers perfect, borne in an involucre, more or less exserted on their stalklets and commonly reflexed or recurved in age, intermixed with narrow scarious bractlets. Involucres 4 to 8-toothed or -lobed, several to many-flowered, borne in heads, peduncled umbels, or solitary along the branches (either sessile or on "pedicels"), or terminal on scape-like stems. Calyx 6-parted or -cleft, colored, persistent about the achene. Stamens 9,

inserted on the base of the calyx. Styles 3; stigmas minute, capitate. Achene triangular, except in a few species. Embryo straight, in the axis of scanty endosperm; cotyledons foliaceous. (Greek erion, wool, and gonu, knee or joint, the nodes hairy in some species.)

A. Calyx not stipe-like at base; involucres turbinate or campanulate, 4 or 5-toothed or lobed, not angled, always borne on scattered pedicels, never congested in heads; annuals (nos. 11 and 12 perennials); mostly deserts or arid plains.—Subgenus GANYSMA.

Plants with leaves at the nodes in the axils of at least the lower bracts as well as in a basal rosette; involucres 4-lobed or -toothed.
- Involucres not cottony.
  - Inner and outer calyx-lobes very unlike.
    - Perianth segments not hooded, all slightly short-clawed....1. *E. angulosum.*
    - Outer perianth segments hooded, all the segments slightly dilated at base... 2. *E. bidentatum.*
  - Inner and outer calyx-lobes nearly alike.....3. *E. gracillimum.*
- Involucres conspicuously cottony.....4. *E. gossypinum.*

Plants with the leaves all in a basal rosette (except nos. 5 and 9), rarely in the axils of the lower bracts; inflorescence with small bracts at the nodes, the bracts in 3s, triangular or oblong, and often more or less connate at base.
- Involucre 4-lobed or -toothed, few (usually 1 to 3)-flowered.
  - Calyx nearly glabrous.....5. *E. spergulinum.*
  - Calyx at least in fruit with hooked bristles.
    - Involucres 2-flowered; achene exserted.....6. *E. hirtiflorum.*
    - Involucres 4 to 6-flowered; achene not exserted.....7. *E. inerme.*
  - Calyx hairy or glandular-hispid, its hairs not hooked.
    - Calyx segments notched or 3-toothed at apex.....8. *E. apiculatum.*
    - Calyx segments entire.
      - Leaves tomentulose or glabrate.....9. *E. ordii.*
      - Leaves hairy pubescent.
        - Calyx pinkish.....10. *E. parishii.*
        - Calyx yellow.....11. *E. trichopodum.*
- Involucre 5-lobed or -toothed, several-flowered.
  - Calyx hairy or pubescent (see also no. 16).
    - Stems usually inflated; leaves hairy-pubescent.....12. *E. inflatum.*
    - Stems not inflated or rarely.
      - Calyx segments not saccate-dilated.
        - Leaves obovate or rounded; involucres glandular.13. *E. pusillum.*
        - Leaves reniform; involucres not glandular.....14. *E. reniforme.*
      - Outer calyx segments saccate-dilated on each side.....15. *E. thomasii.*
  - Calyx glabrous (except no. 16).
    - Pedicels erect .....16. *E. thurberi.*
    - Pedicels not erect.
      - Outer calyx segments obovate; involucres on nodding pedicels.
        - Calyx attenuate at base.....17. *E. cernuum.*
        - Calyx not attenuate at base.....18. *E. nutans.*
      - Outer calyx segments cordate at base.
        - Involucres on divaricately spreading pedicels 1 to 4 lines long.... 19. *E. watsonii.*
        - Involucres on deflexed pedicels 1 line long or less.20. *E. deflexum.*

B. Calyx not stipe-like at base; involucres cylindric or cylindric-turbinate, 5-toothed, 5 (or 6)-nerved or angled, always sessile, solitary or congested in heads; annuals, perennial herbs, or shrubs; mostly deserts or dry foothills.—Subgenus OREGONIUM.

1. Involucres solitary, usually scattered.

Annuals; leaves mostly in a rosette at base.
- Flowering branches mostly elongated.
  - Calyx glabrous; involucres (except the terminal) hugging the branches.
    - Plant compactly branching; outer calyx segments fan-shaped with strongly incurved sides.....21. *E. nidularium.*
    - Plant diffusely or strictly branched.
      - Involucres narrowly turbinate, glabrous or nearly so, the teeth prominent.
        - Petioles not winged; stems and leaves white-woolly..... 22. *E. gracile.*
        - Petioles conspicuously winged; stems and leaves less tomentose... 23. *E. citharaeforme.*
      - Involucres cylindric, almost truncate, the teeth minute.
        - Stems, leaves and involucres white-woolly.....24. *E. virgatum.*
        - Stems glabrous, rarely a little woolly below.
          - Involucres 1¾ to 2½ lines long.....25. *E. molestum.*
          - Involucres ½ to 1½ lines long.
            - Involucres 1 to 1½ lines long, usually fluted and often obscurely constricted a little at tip..... 26. *E. vimineum.*
            - Involucres ½ to ⅞ line long, not fluted..27. *E. baileyi.*

Calyx densely hairy; involucres spreading a little from the branches.....
28. *E. dasyanthemum.*
Flowering branches not elongated.
Repeatedly and shortly forked; flowers yellow.....29. *E. mohavense.*
Bearing an irregularly compound umbel.....30. *E. truncatum.*
Perennials with densely leafy short woody stems.
Inflorescence racemose.
Leaves roundish, densely imbricated on the caudex.....31. *E. saxatile.*
Leaves not roundish.
Involucres scattered on the few elongated branches.
Involucres scattered, 2 to 3 lines long.....32. *E. elongatum.*
Involucres scattered or sometimes approximate towards the ends of the branches, 1 to 1½ lines long.....33. *E. wrightii.*
Involucres secund and crowded on the short branchlets....34. *E. nodosum.*
Inflorescence cymose or paniculate.
Peduncles bearing a divaricately branched panicle.
Involucral teeth glabrous.....35. *E. heermannii.*
Involucral teeth pubescent.....36. *E. plumatella.*
Peduncles bearing corymbose cymes.....37. *E. microthecum.*

2. Involucres 2 to several in heads, rarely solitary; perennials.

Calyx-lobes similar or nearly so, nearly equal.
Not caespitose.
Shrubs, at least woody at base; stems very leafy, commonly fascicled.
Heads or involucres in a dense compound cyme; insular species.
Leaves linear.....38. *E. arborescens.*
Leaves elliptic or oblong.....39. *E. giganteum.*
Heads not in a compound cyme; mainland species or mostly.
Heads terminal on the 2-forked peduncles or racemosely disposed on the forks; leaves mostly ovate or roundish.
Calyx silky; filaments glabrous; leaves ashy beneath.....
40. *E. cinereum.*
Calyx glabrous; filaments hairy at base; leaves white-lanate beneath.....41. *E. parvifolium.*
Heads umbellate, sometimes solitary and terminal; filaments glabrous or nearly so; leaves oblong or linear....42. *E. fasciculatum.*
Herbaceous or mostly so, leafy only at base; heads umbellate or usually so.
Stems not fistulous; heads 1 or few; seashore.....43. *E. latifolium.*
Stems fistulous; heads several to many.
Leaves spreading, oblong or ovate, obtuse, ½ to 2 in. long.....
44. *E. nudum.*
Leaves erect, ovate to ovate-lanceolate, acute, 1 to 3 (or 5) in. long...
45. *E. elatum.*
Stems with trumpet-inflated lower internodes; involucres solitary, racemose.
46. *E. indictum.*
Caespitose.
Involucres very angular, 5-toothed.....47. *E. kennedyi.*
Involucres not angular, in age bladdery, 6 to 8-toothed....48. *E. ochrocephalum.*
Calyx-lobes dissimilar, the outer somewhat cordate at base, attached only by the lower third of the midvein; stems scape-like.
Stems bearing a single head.....49. *E. ovalifolium.*
Stems bearing a simple or irregularly compound umbel.....50. *E. proliferum.*

C. Calyx stipe-like at base; involucres turbinate, 4 to 8-toothed or lobed, either solitary or borne in umbels, the umbels sometimes congested in heads; flowering stems scape-like; perennial herbs; mountains from middle altitudes to alpine.—Subgenus EUERIOGONUM.

1. Involucres with reflexed lobes, the lobes often long.

Calyx hairy.
Peduncles scape-like, bearing a solitary involucre, rarely an umbel.
Calyx yellow.
Peduncles naked.....51. *E. caespitosum.*
Peduncles bearing a whorl of bracts at the middle.....52. *E. douglasii.*
Calyx whitish.....53. *E. sphaerocephalum.*
Peduncle bearing a 3-rayed umbel.....54. *E. tripodum.*
Calyx glabrous.
Peduncles bearing a solitary involucre.....55. *E. siskiyouense.*
Peduncles bearing a simple or compound umbel.
Peduncles scape-like, erect or nearly so.
Leaves mostly spreading, ½ to 1 in. long; umbel simple or compound.
Leaves more or less tomentose.....56. *E. umbellatum.*
Leaves glabrous.....57. *E. torreyanum.*
Leaves erect, 1 to 3 in. long; umbel compound.....58. *E. compositum.*
Peduncles decumbent.....59. *E. lobbii.*

2. Involucres with short erect teeth.

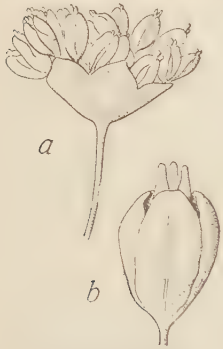
Involucres in heads or umbels.
Calyx villous or hairy.
Leaves glabrous.....60. *E. pyrolaefolium.*
Leaves hairy .....61. *E. latentis.*

Calyx glabrous.
Bracts mostly linear, abundant....62. *E. ursinum.*
Bracts small, inconspicuous.
Rays ½ in. long or less, or umbels capitate; crown compact.63. *E. incanum.*
Rays ½ to 1½ in. long; crown loose....64. *E. marifolium.*
Involucres solitary.
Calyx whitish or pinkish....65. *E. kelloggii.*
Calyx yellow....66. *E. alpinum.*

I.—Subgenus Ganýsma

Involucres campanulate or broadly turbinate, not angled, never congested in heads, always borne on filiform and usually elongated pedicels and disposed in racemes or panicles, often drooping or recurved; bracts in 3s, small, rigid, mostly oblong to triangular; calyx often accrescent, not stipe-like at base; ovary and filaments glabrous; annuals (except nos. 9 and 10); mostly of the deserts or arid plains.

1. **E. angulòsum** Benth. Fig. 324. Stems diffusely and repeatedly dichotomous from near the base, 3 to 14 (or 24) in. high, the branches 4 to 6-angled; stems and leaves whitish tomentose, or glabrate and green; basal leaves roundish to broadly oblong or lanceolate, commonly undulate, ½ to 1 in. long, on rather short petioles; upper leaves oblong to lanceolate or oblanceolate, sessile or nearly so; pedicels of the involucres 3 to 8 lines long, in the forks or terminal; involucres turbinate or hemispherical, 1 line long, minutely glandular, woolly inside; calyx segments white or pink, ½ to ¾ line long, minutely glandular-puberulent, the outer (with darker center) obovate or ovate, concave, the inner linear or lanceolate, distinctly longer than the outer, all abruptly short-clawed.—South Coast Ranges; upper San Joaquin Valley; Inyo Co.; Mohave Desert; coastal S. Cal.; e. to Ariz., thence n. to Wash. and s. to L. Cal. Var. viridéscens Jepson. Leaves oval to elliptic; calyx greenish.—Kern Co. Possibly a seasonal abnormality. Var. maculàtum Jepson. Close to preceding; basal leaves oval, not revolute, ¾ to 1 in. long and ½ to ¾ in. wide; involucre more deeply lobed; outer calyx segments yellowish with an oblong red blotch.—Desert valleys: Mohave Desert; Inyo Co.; n. to western Nev. Var. variáble Parish. Stems divergently branched above the base, leaving an open space in the middle.—Central Mohave Desert; upper San Joaquin Valley.



324. E. angulosum Benth.; *a*, involucre x 4; *b*, fl. x 10.

2. **E. bidentàtum** Jepson. Nun's Veiling. Diffuse annual 5 to 7 in. high; stems repeatedly dichotomous; pedicels 3 to 5 lines long, borne in the forks and terminal, sometimes markedly racemose; bractlets of the involucre spoon-shaped; inner and outer perianth segments very unlike, somewhat unequal, the inner erect, linear-lanceolate, acuminate, arising from a dilated base, the outer spreading a little or approximate about the inner ones; the inner ones rounded-cucullate at the apex with a notch in the hood, each side of the notch ending in a small point; filaments little longer than the ovary.—Upper San Joaquin Valley, w. side (Taft); also a similar but doubtful plant 24 mi. north of Barstow.

325. Eriogonum gracillimum Wats.; *a*, involucre x 4; *b*, fl. x 10.

3. **E. gracíllimum** Wats. Fig. 325. Stems many from the base, diffuse, repeatedly dichotomous and very slender above, 4 to 10 (or 24) in. high; herbage

thinly woolly, especially on the under side of the leaves; basal leaves spreading, oblong to lanceolate, ¾ to 1½ in. long, narrowed below, sessile or shortly petioled, the cauline sessile, erect, oblong-lanceolate, acute, blistery-dilated, strongly revolute, ¾ to 1 in. long; involucres turbinate, borne on filiform pedicels 4 to 8 lines long; calyx pink, minutely glandular-hispid outside, 1 line long, the tips of the segments white and erosulate; outer segments broadly oblong, erect with the white tips abruptly spreading, the edges below the tips incurved; inner segments like the outer but smaller.—Sandy soil, Mohave Desert to the upper San Joaquin Valley and San Luis Obispo Co.

4. **E. gossýpinum** Curran. Diffusely branched from the base, 4 to 10 in. high, thinly tomentose throughout or the upper parts glabrate; leaves oblanceolate, narrowed to a short petiole, or the upper oblong or lanceolate and mostly sessile, 1 to 2 in. long; involucres 1½ lines long, borne on pedicels 1 to 6 lines long, turbinate, cleft to the middle, glabrous outside, heaped inside with a cottony wool in which the 5 to 8 flowers are concealed; calyx ½ line long, obscurely puberulent, the outer segments oblong or spatulate, the inner linear, acuminate, longer.—Upper San Joaquin Valley. A remarkable species.

5. **E. spergulìnum** Gray. Stems erect, dichotomously branching, 4 to 11 in. high, minutely glandular pubescent or the upper half of the internodes usually glabrous; leaves linear, revolute, hairy, ½ to 1½ in. long, in whorls at the base of the stem and at the lower forks, reduced above to small bracts; involucres ¼ line long, deeply 4-toothed, on pedicels 3 to 6 lines long; bract lets none; calyx white with pink midveins, ¾ to 1¼ lines long, obscurely puberulent at base, the segments oblong-quadrate, erosulate at apex or merely acute.—Mt. slopes, North Coast Ranges and Sierra Nevada, 5000 to 9000 ft.

6. **E. hirtiflòrum** Gray. Repeatedly dichotomously branched, 4 to 9 in. high, the stems lightly sprinkled with minute often stipitate glands, otherwise glabrous; leaves obovate, drawn down to a petiole-like base, sparingly hirsutulose, especially on the margins, ½ to 1½ in. long; involucres sessile along the branches and in the forks, or often on pedicels 1 to 3 lines long, narrow, 2-flowered; calyx reddish, ½ line long, its segments oblong, clothed with hooked hairs on the back; achene exserted.—Middle altitudes, Sierra Nevada and North Coast Ranges.

7. **E. inérme** (Wats.) Jepson. Stems 1 to 3 from the base, repeatedly and divaricately dichotomous, 3 to 10 in. high; leaves in a basal rosette, broadly spatulate, ½ to 1 in. long, sessile, glabrous save the ciliate margin; bracts (2 or 3 lines long) and branches hispidulose-glandular; involucres 4-cleft nearly to the base, 3 to 6-flowered, shortly pedicelled (pedicels ¼ to ½ line long); flowers rose-color; calyx hispid, its hairs hooked at tip, at least in age; inner calyx segments smaller than the outer and retuse.—Montane: San Bernardino Mts., n. to Monterey, San Benito and Tulare Cos.

8. **E. ápiculàtum** Wats. Stems erect, trichotomously branching, ½ to 2 ft. high, the peduncles (2 to 4 lines long) in all the forks and terminal, the lower half of the internodes and peduncles somewhat glandular-pubescent; leaves in a basal cluster, obovate or oblanceolate, narrowed below to a petiole, 7 to 12 lines long, hirsute-glandular; involucre 1 to 3-flowered, glabrous, turbinate, nearly 1 line long, 4-lobed, the lobes oblong and as long as tube; pedicels spreading or even deflexed, 2 to 7 lines long; calyx red in the bud, white in flower, ¾ line long, puberulent outside, segments oblong obovate, deeply notched with a slender point in the sinus, sometimes one or more merely truncate, obtuse or apiculate.—Montane, 7800 to 8200 ft.: Mt. San Jacinto; Cuyamaca Mt. A dainty plant with peculiar calyx segments, closely allied to E. parishii.

9. **E. órdii** Wats. Diffusely paniculate, 1½ to 2½ ft. high, the lower parts thinly tomentose, or the leaves glabrate above; leaves in a rosulate basal cluster and in whorls at the lower nodes, roundish to obovate, 1½ to 2 in. long, or the upper smaller, petioled; involucres 4-toothed, ⅛ to ½ line long,

1 to 3-flowered, on pedicels 3 to 9 lines long; calyx dull white or pinkish, densely pubescent outside, ½ to ¾ line long, its segments ovate or oblong.—Caliente, Kern Co.; Split Mt., Colorado Desert; w. Ariz.

10. **E. parishii** Wats. Stems 1 to 3, forming a diffusely branched panicle above the first node, 4 to 9 in. high, glaucous but somewhat viscid with stipitate glands; leaves in a basal cluster, broadly oblanceolate, hirsute, narrowed to a short petiole, ½ to 1½ in. long; pedicels 1 to 4 lines long; involucres 4-lobed at least to middle, ⅛ line long, 1 or 2-flowered; calyx pinkish, minutely pubescent, ½ line long, outer segments ovate, the inner oblong-spatulate.—San Bernardino Mts.; Descanso; Campo; s. to L. Cal.

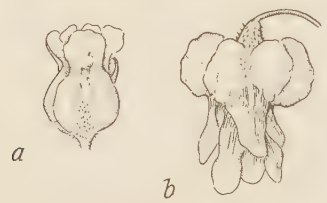
11. **E. trichópodum** Torr. Annual or perennial; stems 1 or several from the base, erect, umbellately 3 to 11-forked at and above the first node, glabrous and glaucous, ½ to 1½ ft. high; first internode often inflated upwards; leaves in a basal cluster, roundish, crinkly, hirsute-pubescent, 6 to 9 lines long on petioles 1 to 1½ times as long; involucres minute (¼ line long), 4-lobed, 2 to 4-flowered, on divaricately spreading hair-like pedicels 3 to 5 lines long; calyx yellow or greenish, densely white-hispidulose on back of the ovate segments, ½ to ¾ line long; inner and outer segments alike and equal.—Colorado and Mohave deserts n. to Inyo Co. and the San Carlos Range; e. to Utah and Ariz.

326. Eriogonum inflatum Torr. & Frem.; *a*, habit x ⅛; *b*, calyx x 12.

12. **E. inflàtum** Torr. & Frem. DESERT TRUMPET. Fig. 326. Annual or perennial; stems several from the base, repeatedly tri- and di-chotomous, forming a diffuse panicle, ½ to 3 ft. high, glabrous, glaucous; lower internodes, especially the lowest pedunculelike one, strongly or slightly inflated upwards or rarely not at all; leaves roundish or round-ovate, cordate at base, 4 to 12 lines long, sometimes to 1½ in. long, short-hirsute but green, on petioles ½ to 2 times as long; pedicels racemose and in the forks, divaricately spreading, 4 to 10 lines long; involucres 3 to 7-flowered, glabrous, turbinate, 5-toothed, ½ line long, in age crowded with linear or oblong bractlets; calyx yellowish, 1 line long, all the segments densely whitish hispid along middle of back, the outer segments lanceolate, their edges revolute and thus becoming linear-lanceolate, the inner segments triangular-lanceolate, with scarious margins.—Colorado and Mohave deserts, n. to the San Carlos Range; e. to Utah and N. Mex. Also called Indian Pipe Weed.

13. **E. pusillum** T. & G. Stems 1 or several from the base, 4 to 12 in. high, trichotomously branched at or from below the middle, glabrous; leaves ovate or rounded, 3 to 8 lines long, tapering at base into the petiole, floccu-lent-tomentose below, less so above, the green bracts and involucres glandular-pubescent; pedicels of the involucres glabrous, filiform, 4 to 14 lines long, in all the forks of the trichotomous panicle and terminal; involucre broadly turbinate; calyx yellow, the segments with red centers, minutely pubescent, 1 line long, the outer segments obovate, the inner oblong; filaments included.—Mohave Desert; Inyo Co.; e. to Nev.

14. **E. renifórme** Torr. & Frem. Stems 1 to several from the base, 2 to 6-forked, forming a diffuse plant 4 to 7 in. high; herbage glabrous and glaucous except the leaves and the slightly hairy lower internodes; leaves all basal, round-reniform or roundish, 5 to 11 lines broad, loosely white-woolly; petioles ½ to 2½ in. long; bracts glabrous but the margins loosely hairy; involucres glabrous, turbinate-campanulate, on pedicels 2 to 6 lines long; calyx whitish or yellowish, minutely glandular-puberulent, ¾ line long, the outer segments ovatish or elliptic, the inner broadly linear; filaments exserted. —Inyo Co. s. to the Mohave and Colorado deserts; L. Cal.



327. Eriogonum thomasii Torr.; *a*, fl. in anthesis; *b*, fl. in fruiting stage. x 12.

15. **E. thomàsii** Torr. Fig. 327. Stems 1 or several from the base, repeatedly and diffusely 2 to 8-forked, 4 to 8 in. high; leaves in a basal tuft, roundish, sometimes subcordate at base, 2 to 8 lines long, rather long-petioled, white-woolly or glabrate; pedicels in the forks and terminal, 2 to 9 lines long; involucres deeply 5-lobed, ½ line long, glabrous; calyx dull yellow, ⅓ to ½ line long, in age whitish and twice as long, hispidulose outside at base, the outer segments ovate, the margin in age saccate-dilated on each side of the cordate base, the inner segments linear-spatulate, finally exceeding the outer.—Colorado Desert, n. to Inyo Co.; e. to Ariz. and Utah.

16. **E. thúrberi** Torr. Fig. 328. Stems 1 or several from the base, diffusely and trichotomously branched, 4 to 13 in. high, tomentulose towards the base; leaves in a basal rosulate cluster, ovate to broadly oblong, woolly below, less so above, ½ to 2 in. long, the petioles about as long or longer; peduncles in the forks and terminal, 2 to 12 lines long; involucres 1 line long, nearly hemispherical; calyx rose-red or white, ½ to ¾ line long; outer calyx segments roundish or transversely elliptic, abruptly narrowed to a broad claw, a floc of wool at summit of claw; inner calyx segments narrowly linear or lanceolate, somewhat hastately lobed near base, ¼ as wide as outer segments.—San Bernardino Valley to San Diego Co. and L. Cal., e. to Ariz.

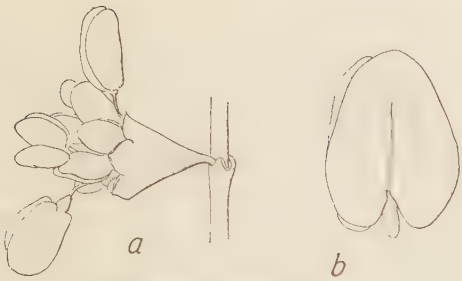
328. Eriogonum thurberi Torr.; *a*, fl. branchlet x 1; *b*, fl. x 10.

E. PANDURÀTUM Wats. Similar to no. 16; involucre turbinate-campanulate, nearly 1 line long; calyx white or pinkish, ½ line long, the outer segments reniform, drawn down to a narrow base, the inner narrowly oblong, undulate.—Palm Sprs., Mt. San Jacinto (acc. Parish).

17. **E. cérnuum** Natt. Stems glabrous, glaucous, diffusely di- or tri-chotomously branched, 6 to 14 in. high; leaves round to oval, white woolly below, glabrate above, 6 to 9 lines long, the petioles nearly as long; pedicels deflexed, ½ to 4 (or 7) lines long, somewhat racemose on the branches; involucres narrowly turbinate; calyx white, glabrous, ¾ to 1 line long, narrowed to a shortly clavate base, its segments obovate or somewhat quadrate, undulate, retuse, the inner half as broad.—Colorado Desert; n. to Ore., e. to the Rocky Mts.

18. **E. nùtans** T. & G. Similar to E. cernuum but pedicels glandular; base of calyx very obtuse (attenuate in E. cernuum).—Lassen Co.; nw. Nev.

19. **E. watsònii** T. & G. Similar to E. cernuum; stem sometimes a little inflated; branches erect; leaves round-cordate; pedicels divaricately spreading,



329. Eriogonum deflexum Torr.; *a*, involucre x 5; *b*, fl. x 10.

1 to 4 lines long; calyx segments oblong, subcordate at base.—Mt. Pinos; e. to Nev.

20. **E. defléxum** Torr. Skeleton Weed. Fig. 329. Stems 1 or several from the base, glabrous and green, 5 to 13 in. high, divaricately branched, the internodes short and branching, intricate, or sometimes simpler with elongated branchlets; leaves in a basal rosette, round-obcordate, whitish tomentose, ½ to 1½ in. long, the petioles half to twice as long; involucre campanulate or broadly turbinate, ½ to 1 line long, with 5 short broad obtuse lobes, on pedicels ¼ to 1 (or rarely 2) lines long, more or less deflexed; calyx white, or turning pink, glabrous, ½ to 1 line long, the outer segments elliptic or elliptic-ovate, very obtuse, cordate at base, the inner narrowly ovate-acuminate, shorter than the outer, half as wide.—Desert washes and flats, Colorado and Mohave deserts to Inyo Co.; e. to Nev. and Ariz.

II.—Subgenus **Oregònium**

Involucres cylindric or cylindric-turbinate, 5-toothed, 5 or 6-nerved or angled, always sessile, solitary or congested in heads, always erect; bracts on the flowering branches in 3s, connate at base; calyx not at all or little accrescent, not stipe-like at base; ovary and filaments mostly glabrous; annuals, perennial herbs, or shrubs; mostly of deserts or arid foothills.

21. **E. nidulàrium** Cov. Fig. 330. Stems 1 or many from the base, repeatedly and regularly dichotomous, the forks short, making a dense mass of intricate branches which in well-grown plants curve in at maturity and suggest resemblance to a bird's nest; whole plant cobwebby-tomentose, often reddish in age, 3 to 8 in. high; leaves roundish ovate to orbicular and subcordate, 3 to 6 lines long, the petioles 1 to 2½ times as long; involucres sessile in all the forks and along the branches, ½ line long; calyx red, white or yellowish, glabrous, ¾ to 1 line long; outer segments somewhat quadrate, dilated at the truncate apex, the sides incurved; inner segments similar but narrower; ovary glabrous, scabrous on upper part.—San Bernardino and Inyo Cos.; e. to Nev.

330. Eriogonum nidularium Cov.; fl. x 12.

22. **E. grácile** Benth. Stems strictly branched and forming a narrow panicle or more diffuse, ½ to 2½ ft. high; thinly tomentose throughout, becoming floccose; leaves oblanceolate or broadly oblong, attenuate to a slender petiole, ½ to 2 in. long, tomentose on both sides or less so above; involucres distributed along the elongated branches, glabrous or nearly so, barely exceeding the bracts and half concealed by them, ¾ to 1 line long, cylindric-campanulate, the teeth acute, prominent, spreading; calyx white, rose-color or yellowish, glabrous, ¾ line long.—Dry plains, valleys and low hills: Great Valley and Coast Ranges to S. Cal.; s. to L. Cal.

23. **E. cítharaefórme** Wats. Stems 1 or several from the base, freely branching, 1 to 3 ft. high; herbage thinly tomentose, glabrous or glabrate above; leaves in a basal rosette, or a few at the lower nodes, roundish to ovate, ¾ to 2 in. long, gradually or cordately contracted to a long winged petiole, the wing crenulately toothed, attenuate downward; involucres

turbinate, 1½ lines long.—San Luis Obispo Co. and e. to the inner South Coast Ranges.

24. **E. virgàtum** Benth. Tomentose throughout, stem slender, erect, simple, or the few branches rather strict, 1 to 3 ft. high; leaves in whorls on lower part of stem or rosulate at the base, oblanceolate (or obovate), ½ to 2 in. long, on slender petioles, the margin usually undulate; involucres 2 to 2½ lines long, rather remote, tomentose, cylindric, truncate or nearly, the teeth minute; bracts lanceolate, shorter than the involucres; calyx glabrous, 1 line long, white, buff, sulphur-yellow or pink.—Stream beds: Coast Ranges; Sierra Nevada, 500 to 5000 ft.

25. **E. moléstum** Wats. Habit of E. vimineum, glabrous and glaucous above the white-woolly leaves; leaves roundish or cordate, crisped or undulate, 4 to 6 lines long; flowers white, ¾ to 1 line long; involucres cylindric-turbinate, 2½ lines long; ovary scaberulous.—San Gabriel, San Bernardino and San Jacinto mountains and s. to San Diego. Var. DAVIDSÒNII Jepson. Habit and foliage of E. molestum but involucres 1¼ to 1¾ lines long, cylindric-prismatic; calyx pink or white; bracts more united and cup-like.—San Gabriel Mts. to the San Jacinto Mts.

26. **E. vimíneum** Dougl. Fig. 331. Stems 1 or several, glabrous wholly or at least above the base, erect, 3 to 18 in. high, much branched from near the base, the branches elongated and virgate, with the lower often in whorls of 3 to 5; lower forks sometimes leafy; leaves orbicular to broadly ovate, 3 to 12 lines broad, greenish, reddish, or yellowish, white tomentose below, the margin undulate, at least in age, the petioles 1 to 3 times as long; involucres very narrow, cylindric, strongly angled, 1 to 1½ lines long; flowers rather few, rose-color, or yellowish, glabrous, 1 line long; outer calyx segments obovate, rounded at apex, the inner oblong.—Coast Range hills, especially slopes near rocky outcroppings.—Var. ÉLEGANS Jepson. Stem for a half-inch at base densely clothed with white-woolly obcordate small leaves; involucres turbinate; calyx rose-red or whitish, ½ line long.—San Luis Obispo Co. Var. CANÌNUM Greene. Stems several from the base, procumbent or very diffuse, repeatedly di- or at first tri-chotomous, with short forks and branchlets, or the stem sometimes solitary, erect and branching only at the first node; inflorescence and stems reddish; involucres narrowly turbinate, mostly at the ends of the short branches or sessile in the forks; calyx rose-red.—Oakland Hills; Marin Co.; Monterey Co.

331. Eriogonum vimineum Dougl.; involucre x 5.

27. **E. bàileyi** Wats. Diffusely branched from the base, glabrous, 5 to 12 in. high, and half again as broad, with something of the delicate or slender habit of E. gracile; leaves roundish to ovate, white-woolly; involucres cylindric or a little enlarged upwards, ½ to ⅞ line long; calyx lemon yellow or whitish, delicately glandular, ⅔ line long; outer segments ovate or oblong, the inner smaller, narrowly ovate; body of achene lenticular, strongly beaked.—Desert valleys: Mohave Desert; Inyo Co.; Nev. to Ariz. and Wash. Var. BRACHYÁNTHUM Jepson. Stems usually greenish rather than pale or glaucous, at base with a persistent lanate zone; internodes shorter and relatively stouter; bracts redder; calyx glabrous in age, usually constricted a little at middle and flaring at tip, as often in the species.—Mohave Desert n. to Inyo Co. Well-grown plants recall in miniature the habit of a Texas Umbrella Tree. Var. TOMENTÒSUM Wats. Stems thinly tomentose.—San Bernardino Mts.

28. **E. dasyánthemum** T. & G. Fig. 332. Stems thinly tomentose or soon glabrate, 1 to 2 ft. high, branching from or near the base, and often bush-like in habit; leaves roundish, plane, tomentose below, less so above, ½ to 1½ in. long, abruptly contracted to a slender petiole half to as long; involucres 1 or 2 in a place, rather remote, cylindric, 2 lines long, tomentose between the

callous ribs; calyx white or red, 1 line long, densely hairy on outside, glabrous inside; filaments glabrous or slightly pubescent at very base.—Low dry hills, inner Coast Range from the Vaca Mts. to Lake Co. and n. to the Yollo Bollys. Sept.-Nov. This replaces E. vimineum of the middle North Coast Range.

332. Eriogonum dasyanthemum T. & G.; involucre x 5.

29. **E. mohavénse** Wats. Stems 1 or several from the base, repeatedly tri- and dichotomously branched, 4 to 12 in. high, glabrous or a little hairy at the nodes; branches green, bracts often red; leaves in a rosulate basal cluster, roundish or ovate, 2 to 6 lines long, abruptly narrowed to a slender petiole; involucres turbinate-bellshaped, very shortly 5-toothed, glabrous outside, a hairy ring inside at throat, ¾ line long, sessile in the forks and terminal on the short branchlets; calyx yellow, glabrous, ½ line long, the outer segments oblong or elliptic, the inner segments sometimes white, half as broad; achene partly exserted.—Dry hills, Mohave Desert. Involucres almost flaring just at mouth. Remarkable for the small size of its flowers.

30. **E. truncàtum** T. & G. Stems mostly several from the base, thinly tomentose or glabrate, 6 to 15 in. high, naked, bearing a leafy-bracted irregular umbel; leaves obovate or oblong-oblanceolate, with undulate margin, 1 to 2 in. long, attenuate to a slender petiole nearly as long; umbel of 3 to 6 elongated unequal rays loosely once or twice di- or tri-chotomous; bracts almost minute; involucres 2 to 4 in a cluster or solitary, tomentose, oblong-turbinate, 2 lines long; calyx light rose-color, glabrous, 1⅓ lines long; filaments pubescent at very base.—East base of Mt. Diablo n. to Antioch. The sinuses between the involucral teeth are completely filled by a membrane so that the involucre is truncate. Var. ADSÚRGENS Jepson. Leaves roundish, 5 to 11 lines broad, abruptly long-petioled; involucres turbinate, 1 line long, obviously toothed.—Inner South Coast Range from Waltham to Hernandez.

31. **E. saxátile** Wats. Flowering stems erect, naked, paniculately 1 or 2-forked, tomentulose, ¼ to 1 (or 2) ft. high, arising from a woody caudex; caudex simple or branched, 2 to 5 in. high, densely crowded or even imbricated with leaves; leaves covered with a dense silvery felt, roundish to round-ovate, shortly acute, ¼ to 1 (or 1½) in. long, shortly petioled; involucres tomentulose, 1½ to 2 lines long, scattered along the branches of the panicle; calyx white or pale yellowish, glabrous, 3 to 4 lines long, gradually narrowed to a stipe-like 3-angled or 3-carinate base as long as the segments; inner calyx segments obovate, rather exceeding the narrower outer ones; filaments hairy at very base.—Mt. sides, 3000 to 8500 ft.: cismontane S. Cal., n. in the Sierra Nevada to the Kaweah River and in the Coast Ranges to the Santa Lucia and Santa Cruz mountains.

32. **E. elongàtum** Benth. Flowering stems erect, slender, leafless, simple or strictly branching, 1 to 4 ft. high, arising from a branching base composed of leafy stems 3 to 9 in. high; herbage whitish-tomentulose throughout, the leaves beneath densely white-tomentose, above glabrate; leaves scattered or congested, ovate to oblong-lanceolate, acute, the margin undulate, 1 to 1½ in. long, narrowed to a short petiole; involucres remotely scattered along the elongated stems or branches, cylindric, 3½ lines long, truncate or obscurely toothed; calyx white, glabrous save a little hairiness on midveins inside, 1½ lines long, its segments obovate, obtuse, the inner slightly longer than the outer; filaments glabrous.—Mt. sides and cañons near the coast from Monterey Co. to cismontane S. Cal.; s. to L. Cal.

33. **E. wríghtii** Torr. Flowering peduncles several, arising from the short erect very leafy branches of the much-branched woody base, the plants 4 to

12 in. high; leaves obovate or oblanceolate, acute, white-tomentose, 2 to 6 lines long, short-petioled, often with smaller ones fascicled in the axils, or the lowermost twice as long with longer petioles; peduncles short, once or twice di- or tri-chotomous, the branches erect and rather strict; involucres scattered along the branches or congested towards the ends, campanulate-tubular, prominently but obtusely angled and woolly between the angles; calyx white or pink, 1½ lines long, its segments obovate, rounded at apex, the inner longer than the outer.—Stream beds or mt. slopes: Sierra Nevada; Coast Ranges towards the interior; S. Cal.; e. to Tex. Var. SUBSCAPÒSUM Wats. Leafy branches short, forming a close dense mat with short flowering stems; calyx smaller, the segments less narrowed at base.—High montane. Var. MEMBRANÀCEUM Stokes. Petioles dilated at base into a sheath clasping the stem; leaves glabrate above; sheaths soon glabrate, ½ to 1 line long.—S. Cal. mts.

34. **E. nodòsum** Small. Stems several from the base, tri- or di-chotomously branching, leafy below, ¾ to 1¼ (or "3½") ft. high, white-tomentulose; involucres turbinate-cylindric, 1½ lines long, sessile and unilaterally crowded on the ultimate (½ to 1 in. long) branchlets or pedicellate in the forks; calyx glabrous, 1½ lines long, parted about half-way, the base coriaceous; outer segments roundish, notched at apex, the inner similar, half as broad; filaments pilose below the middle; achene minutely scaberulous.—Desert regions: White Mts., Inyo Co.; Imperial Co.; Nev. to L. Cal. Var. JÀEGERI M. & J. Upper portion of plant glabrous.—Morongo Wash.

35. **E. heermánnii** D. & H. Stems woody at base, leafy below, soon branching into a panicle, 1½ to 2 ft. high; peduncle of the panicle short, repeatedly 2 or 3-forked and finally ending in somewhat spinescent branchlets; forks of the panicle rather short but straightish, rigid, somewhat divaricate, as if fistulous and a little constricted at the joints; plant flocculent or glabrate on lower part, glabrous above; leaves oblong, 6 to 8 lines long, petioled; involucres hemispherical or broadly turbinate, 1 line long, the broad rounded lobes scarious-margined and overlapping at the sinuses; calyx 1 to 1¼ lines long, glabrous, the outer segments orbicular, the inner oblong, much narrower.—Mohave Desert; Mt. Pinos; s. Sierra Nevada; e. to Nev.

36. **E. plumatélla** D. & H. Stems from a woody base, forming a compact erect cluster, branching above into a broad head, 1 to 2 ft. high; branches straightish or zigzag, covered with a dense thin tomentum; forks (or internodes) of the panicle short, somewhat curved, continuously divaricate so that the inflorescence eventually appears almost contorted; involucres narrowly campanulate, glabrous outside, the teeth pubescent inside, not scarious margined; calyx white or pinkish, ⅔ line long; outer segments obovate, truncatish, inner obovate, rounded or subacute, all cuneate at base; filaments a little hairy at base; beak of the ovary 3-angled, roughish.—Southern Sierra Nevada in Kern Co.; Mohave Desert. Flowers in rather small and compact clusters towards the ends of the rather long panicle branches.

37. **E. microthècum** Nutt. Stems woody at base, diffusely but shortly branched, 4 to 10 in. high, whitish tomentulose throughout or the leaves above and the stems and involucres glabrate; leaves oblong-spatulate to elliptic, sometimes revolute, 4 to 8 lines long, shortly petioled; peduncles 1 to 4 in. long, bearing a small cymosely branched compound umbel; involucres sessile, those in the axils pedicellate, narrowly campanulate, 1½ lines long, shortly toothed; calyx white, pink or yellow, glabrous, 1 to 1½ lines long, its lobes about equaling the tube; outer lobes round, often subcordate at base, the inner lobes elliptic.—Montane, 5000 to 10,000 ft.: San Antonio Mts.; e. slope of the Sierra Nevada; n. to Wash., e. to the Rocky Mts.

38. **E. arboréscens** Greene. Shrubby, several ft. high, the trunk 3 to 4 in. thick; leaves crowded at the ends of the many branchlets, linear or oblong, strongly revolute, white-tomentose beneath, glabrate above, ½ to 1¼ in. long; peduncles stout, bearing a large compound cyme, the involucres in capitate clusters; calyx rose-color, densely white-villous at base.—Santa Barbara Isls.: Santa Cruz; Anacapa; Santa Rosa.

39. **E. gigantèum** Wats. Freely branching shrub 2 to 8 ft. high, bearing its white foliage towards the ends of the tomentose or glabrate branches; trunk with rough bark, 1 to 4 in. in diameter; leaves leathery, ovate, obtuse, 1 to 2½ in. long, white-lanate on both sides or glabrate above, strongly veined beneath, the petioles ½ to 1 in. long; peduncles stout, bearing a dense tri- or di-chotomously branched compound cyme 2 to 12 in. broad; involucres sessile or pedicellate, somewhat crowded on the branchlets, campanulate with very low teeth, almost as if truncate, 2 lines long, densely close woolly outside; calyx 1 line long, densely white-hairy toward the cuneate base, its segments broadly obovate, rounded at apex, the inner narrower; filaments pubescent at base.—Santa Barbara Isls.: Santa Catalina; San Clemente; Santa Cruz.

40. **E. cinèreum** Benth. Shrub 2 to 5 ft. high, the stems tomentulose; leaves ovate, puberulent above, obtusish, the larger abruptly short-cuneate at base, undulate, thinly gray-tomentose beneath, ½ to 1¼ in. long, short-petioled; peduncles elongated, sparingly dichotomous, the heads few and scattered in the forks; involucres tomentulose, 1½ to 2 lines long, with 5 triangular teeth; calyx densely silky outside, its segments narrowly obovate, obtuse, 1½ lines long; filaments glabrous.—Bluffs and foothills along the coast: Santa Barbara to San Pedro.

41. **E. parvifòlium** Sm. Shrub 1 to 3 ft. high, or woody only at base; branches densely leafy with fascicled leaves; leaves thick, oblong-lanceolate to ovate or roundish, undulate and irregularly revolute-margined, truncatish or subcordate at base, dark green and glabrate above, white with a dense felt beneath, 2 to 6 lines long, shortly petioled; peduncles short, simple or umbellately 2 or 3-forked, bearing terminal or racemosely scattered heads of involucres, the heads few, compact, also sessile in forks when the inflorescence is umbellate; involucres 2 lines long, glabrate outside, densely woolly on inside at throat; calyx white, glabrous, 1½ to 2 lines long, its segments obovate, the outer obtuse, the inner slightly broader and retuse; filaments a little hairy at base.—Sand-dunes and hillsides near the coast: Monterey Bay to S. Cal.

42. **E. fasciculàtum** Benth. FLAT-TOP. Stems woody at base, 2 to 3 ft. high with shreddy bark, the very leafy branches ending in a simple or compound umbel or the umbel reduced to a single head; leaves oblong, linear or oblanceolate, revolute-margined, 4 to 8 lines long, drawn down to a narrow base, densely white-woolly below, usually green and glabrate above; flower clusters in heads, these terminal on the unequal rays or sessile in the forks; rays 1 to 4 in. long; bracts linear; involucres 2 lines long, with short acute teeth; calyx white, glabrous, 1¼ to 1¾ lines long, the outer segments elliptic, the inner obovate and narrower, all rounded at apex; filaments glabrous or nearly so.—Abundant on mesa and mt. slopes. It is generally known as "Wild Buckwheat" and is the third most valued native bee-plant after White Sage and Black Sage. The form with glabrous flowers is confined to the sea-coast from Santa Barbara to San Diego. The two dominant mesa forms are the following: Var. FÒLIOLÒSUM Stokes. Peduncles long (4 to 10 in.); leaves more strongly revolute-linear, green but pubescent above, tomentose beneath; calyx slightly hairy outside.—Chaparral slopes, the abundant form: cismontane S. Cal. and n. to Monterey Co. and Mt. Hamilton Range (Corral Hollow). Var. POLIFÒLIUM T. & G. Peduncles long; foliage gray, the leaves commonly less revolute, hoary above, tomentose below; calyx often conspicuously hairy outside, especially towards the base.—Desert slopes of the mts. in the Colorado and Mohave deserts, w. to Palomar, n. to Bakersfield and Inyo Co.; e. to Nev. Var. FLAVOVÍRIDE M. & J. One ft. high; herbage green; calyx glabrous without, hairy within.—Mts. on n. side of Colorado Desert.

43. **E. latifòlium** Sm. Flowering stems from a densely leafy caudex, stout, tomentulose, naked, ½ to 2 ft. high, 2 to 4-forked above, the forks simple or again forked; involucres in capitate clusters, terminal and sessile in the forks, or the whole inflorescence often reduced to a single large head or

with one proliferous branch from under the first head; leaves ovate to oblong, obtuse or acute, at base rounded or cordate, rarely cuneate, often undulate, densely white-woolly or lanate, or glabrate above, 1 to 2½ in. long, the petioles short or long; involucres tomentose, 2 lines long; calyx glabrous, white or light rose-color, 1½ lines long; filaments woolly at base.—Rocky cliffs or sandy places along the sea-coast from Humboldt Co. to S. Cal.

333. Eriogonum nudum Dougl.; *a*, habit x ⅓; *b*, fl. x 4.

44. **E. nùdum** Dougl. TIBINAGUA. Fig. 333. Tall and slender, 1 to 3 ft. high, the stems glabrous, peduncle-like, often fistulous, sometimes inflated, branching into a usually large panicle, the leaves all at base on the short woody caudex; leaves broadly ovate or oblong, obtuse, cordate or abruptly cuneate at base, undulate, densely tomentose beneath, glabrate above, 1 to 2 in. long, on slender petioles; involucres 2 or 3 lines long, glabrous or nearly so, 2 to 6 in each cluster; calyx glabrous, at least outside, 1 to 1½ lines long, usually white, sometimes rose-color or yellow; filaments a little hairy at base.—Very common on dry hills, valley flats or mt. slopes: coastal S. Cal.; Coast Ranges; Sierra Nevada; n. to Ore. July-Oct. Herbage used as "sour dock" for pies by settlers in Shasta Co. Var. DEDÚCTUM Jepson. Stems many from the base, 5 to 13 in. high, umbellately trichotomous above, glabrous; leaves oval, ½ to ¾ in. long, on petioles 3 to 4 times as long.—High Sierra Nevada, 7500 to 9500 ft. Seems no more than a slightly reduced state of the common form of the species prevailing at lower altitudes in the Sierra. Var. SCAPÍGERUM Jepson. Like var. deductum but the inflorescence reduced to single heads terminating the slender scape-like stems.—High mts. about the upper Kern River. Var. PUBIFLÒRUM Benth. Stems 1½ to 3 ft. high, often inflated, glabrous, the branches elongated; involucres 1 to 3 in a place; calyx deep yellow, hairy towards the base.—Arid or desert region: Pahute Peak; Mt. Pinos; Independence; Goose Valley, Modoc Co.; Yreka. Var. PAUCIFLÒRUM Wats. Stems often inflated, indefinitely dichotomous, the involucres scattered along the slender branches or occasionally in pairs; calyx white.—S. Cal.: San Jacinto and San Bernardino mountains. Var. OBLÓNGIFÒLIUM Wats. Stems and involucres whitish tomentulose, the stems above twice di- or tri-chotomous, the branches rather strict; leaves broadly oblong, ½ to 2½ in. long, abruptly contracted to slender petioles 1½ to 3 in. long; calyx white or rarely pale yellow, somewhat pubescent on the inner lobes.—Napa Co. to Humboldt Co. and e. to Modoc Co., thence s. to Nevada Co. Var. SULPHÙREUM Jepson. Like the preceding var. but the branches of the inflorescence more spreading; calyx pale yellow or white, a little hairy at base.—Mendocino Co. to Siskiyou Co. Var. AURICULÀTUM J. P. Tracy. Stems ½ to 2½ ft. high, somewhat caudex-like at base, the caudexes set with leaves or old leaf-bases, ½ to 4 in. high, each giving rise to a glabrous glaucous peduncle bearing a dichotomous panicle; peduncles sometimes strongly fistulous; leaves oblong to elliptic, obtuse, truncatish or subcordate at base, crenulate-undulate margined, densely white-lanate below, soon glabrescent and deep green above, 1 to 2½ in. long; panicle usually large, the heads large, terminal and lateral, less commonly in the forks.—Dry rocky hills, central Coast Ranges. Var. GRÁNDE Jepson. Tall (3 to 5 ft. high) with a woody base; leaves ovate-oblong, the margin undulate-revolute,

white-lanate below, 1½ to 3 in. long; involucres 3 lines long; calyx nearly or quite glabrous inside.—Santa Barbara Isls.

45. **E. elàtum** Dougl. Stems rigid and rush-like, rarely naked, 1 to 2½ ft. high, sometimes inflated, bearing a trichotomous panicle, glabrous and glaucous; leaves erect, ovate to ovate-lanceolate, 1 to 3 (or 5) in. long, on petioles mostly as long; involucres in terminal clusters of 2 to 4, or solitary in the forks, either sessile or shortly pedunculate, hairy-pubescent, 2¼ lines long, 5-toothed, the teeth scarious-margined; calyx white, 1 to 1½ lines long, its segments obovate, rounded at apex, with broad hairy-pubescent midvein. —East or transmontane side of the Sierra Nevada from Mono Co. to Modoc and Siskiyou Cos. Var. VILLÒSUM Jepson. Stems villous-pubescent.—Dry hills, Siskiyou Co. to Modoc Co. Var. INCÚRVUM Jepson. Pubescence of preceding variety; branches or rays of ternately trichotomous panicle curving, fragile at the joints.—Shasta Sprs.

46. **E. indíctum** Jepson. Stems 1 to 2 ft. high, several from the base, glabrous, glaucous, the lower internodes inflated like a slender trumpet; leaves ovate or deltoid-ovate, truncatish at base, white-woolly below, whitish-arachnoid above, persistent on both faces, 1½ to 2½ in. long, the petioles as long and with a broad clasping base; involucres externally glabrous, tubular but a little widened upward, 2 lines long, solitary and racemose along the slender branches of the dichotomous panicle; calyx yellowish, glabrous.—Dry hills, San Carlos Range. Nearly related to E. nudum.

47. **E. kennèdyi** Porter. Stems scape-like, wiry, 3 to 8 in. high, arising from a very dense leafy cushion; leaves obovate or oblong, revolute, white-woolly, 1½ to 5 lines long; involucres tomentulose or glabrate, turbinate-campanulate, nerved and rather strongly angled, deeply triangular-toothed, 1½ to 2 lines long, clustered in a terminal head; calyx white or pink, glabrous, 1 to 1½ lines long, segments oblong-obovate; ovary scarious.—Desert slopes or arid plateaus, n. and s. of the Mohave Desert.

48. **E. óchrocéphalum** Wats. Stems scape-like, 2 to 6 in. high, erect from a caespitose leafy base; leaves silvery-tomentose, oblanceolate to ovate, ¾ to 1¼ in. long, narrowed to a petiole half to as long; involucres in a capitate cluster, turbinate-bellshaped, bladdery in age, 1½ to 2½ lines long, the 6 to 8 short lobes erect; calyx yellow, glabrous, 1 to 1¼ lines long, the segments elliptic, the inner narrower, all obtuse; filaments obscurely puberulous at base.—Nw. Nev. and e. Ore. Var. AGNÉLLUM Jepson. Dwarfed form, 2 to 4 in. high, the upper portion of peduncles and heads a little glandular; leaves ovate or narrowly obovate, 2 to 4 lines long, petioled.—N. Sierra Nevada (Placer Co. to Modoc Co.).

49. **E. ovalifòlium** Nutt. Fig. 334b. Subalpine dwarf, the scape-like stems slender, tomentulose, ½ to 3 in. high, rising from a dense leafy cushion; leaves round-ovate to obovate, 1 to 4 lines long, contracted to a usually short petiole; involucres turbinate, woolly, several crowded together in a very close head with 3 or 4 short bracts; calyx white, with green midribs, often fading pinkish, glabrous, 1 to 1½ lines long; outer calyx segments elliptical, subcordate at base, their margins quite free and distinct to base, the inner broadly spatulate; filaments hairy at very base.—Granite peaks and ridges, 9000 to 12,000 ft.: Sierra Nevada from Fresno Co. to Nevada Co.; Snow Mt., Lake Co.; n. to B. C., e. to Rocky Mts. Var. VINÈUM Nelson. Involucres vase-shaped, constricted near the top; calyx wine-red, 2½ to 3 lines long, its segments unequal.—San Bernardino Mts.; Ore. and Wash. Var. NIVÀLE Jones. Fig. 334a. Head

334. Eriogonum ovalifolium Nutt.; *b*, fl. x 5; *a*, var. nivale Jones, habit x ⅔.

small and compact, appearing like a single involucre; flowers red; outer calyx-segments obovate; filaments hairy or glabrous.—S. Sierra Nevada.

50. **E. prolíferum** T. & G. Stems erect, naked, scape-like, 4 to 7 in. high, bearing an umbellate inflorescence and arising from a compactly branched caudex with very short leafy branches; herbage tomentulose, the leaves densely white-woolly; leaves ovate, mostly obtuse, 4 to 12 lines long, on petioles as long or longer; umbels with 3 rays from beneath the sessile central involucre; rays ½ to 2 in. long, somewhat unequal, bearing a cluster of 2 or 3 involucres, or one or more of the rays again shortly 3-radiate; involucre 5-toothed, the teeth large, almost hooded; calyx white, 2 to 2½ lines broad, the outer segments roundish quadrate or elliptic (nearly as broad at base and apex as at middle), attached by the lower ⅓ of the midnerve, the sides free and overlapping; inner segments obovate, narrowed to a claw-like base.—Valleys and mt. slopes, 2600 to 5000 ft.: Sierra Valley to Siskiyou Co.; n. to B. C., e. to Rocky Mts.

III.—Subgenus **Eueriógonum**

Involucres turbinate, 4 to 8-toothed or -lobed, either solitary or borne in umbels, the umbels sometimes congested in heads; bracts foliaceous; calyx stipe-like at base, often accrescent; filaments mostly hairy or pubescent at base; flowering stems (peduncles) scape-like; perennials; mountains from middle altitudes to alpine summits.

51. **E. caespitòsum** Nutt. Dwarf, matted, the scape-like peduncles slender, naked, 2 to 4 in. high, bearing a single involucre; leaves white-tomentose, oval to oblong-spatulate, 2 to 3 lines long, the petioles ⅛ to as long; involucral lobes linear, as long or longer than the turbinate tube; calyx yellow or fading reddish, 1 to 1½ lines long, in age nearly twice as long, hairy on the mostly stipe-like base; filaments pilose; ovary glabrous.—Mt. slopes and dry plateaus e. of the Sierra Nevada: White Mts.; Warner Mts.; n. to Ore., e. to Rocky Mts.

52. **E. douglásii** Benth. Matted white-woolly dwarf similar to the preceding, the scape-like peduncles with a whorl of 5 or 6 oblanceolate bracts at the middle; involucral lobes linear, longer than the tube, reflexed; calyx yellow, hairy at base and along the midrib of the segments, stipe-like at base, 2 to 3 lines long, its segments obovate, obtuse, the inner exceeding the outer in age; lower half of filaments pilose; ovary hairy towards apex.—N. Sierra Nevada, e. slope from Nevada Co. to Lassen Co., 4200 to 6500 ft.; Nev. to Wash.

53. **E. sphaèrocéphalum** Dougl. Peduncles 3 to 6 in. high, bearing a solitary involucre and with a whorl of leafy bracts at their middle, or the whorl subtending a 2 to 4-rayed umbel, the rays also bearing a central whorl of bracts; base much-branched, with many short woody leafy branchlets; leaves oblong to broadly oblanceolate, acute, narrowed to a short petiole, 5 to 10 lines long, white-woolly below, soft pubescent above, the margins often revolute; involucre almost bowl-shaped, 3 to 4 lines long, its (7 or 8) oblong lobes as long or longer than the tube; flowers numerous in an involucre, forming a globose cluster; calyx whitish, very villous inside and out, especially towards the base, stipe-like at base, 4 lines long, the segments obovate or elliptic, obtuse; filaments hairy on lower half; ovary densely villous except at base.—Lassen Co. to Shasta Co., 2600 to 4200 ft., n. to Wash. May-June.

54. **E. trípodum** Greene. Habit similar to E. sphaerocephalum but more slender and taller (10 to 14 in. high); umbel 3-rayed, the rays 3 to 5 in. long, bearing a whorl of bracts at the middle or sometimes 2-forked and again bracteate; calyx yellow, densely hairy, 2 to 3 lines long, the stipe-like base very short; filaments hairy below; ovary very strongly angled, hairy at apex.—Indian Valley, Lake Co.; Benton Mills Road, Mariposa Co.

55. **E. sískiyouénse** Small. Like E. umbellatum but the involucre solitary on an erect peduncle 4 to 10 in. high, with a whorl of bracts at middle (that is, the umbel reduced to one ray which is as long or longer

than the peduncle); bracts foliaceous, ovate, petioled, 2 to 6 lines long, the basal leaves of the same shape but usually larger.—Montane: Scott Mts., Siskiyou Co.; Calaveras Big Trees; Lake Merced, Yosemite.

56. **E. umbellàtum** Torr. SULPHUR-FLOWER. Fig. 335. Peduncles erect or ascending from a branching woody base, naked, 3 to 5 in. high, tomentulose or glabrate; leaves ovate, glabrate above, white-woolly beneath, 3 to 12 lines long, on petioles ¼ to ½ as long; umbels simple, subtended by a whorl of linear to obovate bracts, its rays 3 to 9 (rarely reduced to 1), 5 lines to 1¼ (or 3) in. long, these and the bracts soft-pubescent; involucre 8-lobed, the lobes reflexed, nearly as long as the turbinate tube, the tube and throat crowded with the floccose-woolly bractlets; flowers sulphur-yellow; calyx glabrous, gradually narrowed into the long stipe-like base, 2 to 3, or in age 3 to 4 lines long; filaments pilose on lower half.—Higher Sierra Nevada and Coast Ranges, 4000 to 9000 ft.; n. to Wash., e. to Rocky Mts. Var. STELLÀTUM Jones. Rays simple and bearing a whorl of bracts at their middle or usually forked and the secondary rays similarly bracteate.—San Bernardino Mts.; Sierra Nevada; Siskiyou Co.; n. to Wash. Var. BAHÌAEFÓRME Jepson. Inflorescence freely and irregularly branched.—Tehachapi region. Var. MÌNUS Jtn. Herbage permanently tomentose; peduncles ½ to 1⅛ in. high, bearing simple 1 to 3-rayed umbels; rays 2 to 4½ lines long.—Subalpine, San Antonio Mts. Var. MONOCÉPHALUM T. & G. Dwarf mountain form with the umbel reduced to a single ray, that is, the peduncle naked or bracteate and bearing a solitary involucre.—Range of the species but far less common.

335. Eriogonum umbellatum Torr.; *a*, umbel, past anthesis x ⅝; *b*, fl. x 4.

57. **E. torreyànum** Gray. Habit of E. umbellatum but stems and leaves glabrous; outer rays of the umbel with a whorl of bracts midway; leaves obovate, thickish, about 1 in. long, narrowed below to a petiole as long; involucral lobes sparingly pubescent; calyx yellow, 4 to 5 lines long; filaments hairy below.—N. Sierra Nevada, 5000 to 7000 ft.

58. **E. compósitum** Dougl. Scape-like stems stout, 6 to 16 in. high from a simple short caudex, glabrate; leaves oblong-ovate or deltoid-ovate, cordate at base, 1½ to 2 in. long, with a close white felt beneath, green above or woolly-flocculent; petioles long, mostly 1 to 2½ times length of blade; bracts linear or oblanceolate; umbel 6 to 10-rayed, the rays sometimes with a blackish band at middle, ½ to 2 in. long, each bearing a capitate cluster of 1 to 5 involucres or a several-rayed umbellet; involucre broadly turbinate, woolly, 8-toothed, the teeth short, acute; calyx cream-color or yellow, glabrous, contracted to a stipe-like base, 2 to 4 lines long; segments elliptic, the inner becoming ⅓ longer in age; filaments short hairy at base.—North Coast Ranges; n. to Wash.

59. **E. lóbbii** T. & G. Peduncles lying along the ground, 2 to 7 in. long, borne on a densely leafy stout caudex; caudex crowded below with old leaf-bases and crowned with a tuft of silvery white leaves; herbage densely white-woolly; leaves roundish, oval or ovate, ½ to ¾ or 1¼ in. long, narrowed to rather broad petioles ½ to as long; umbels simple, bracteate, ascending from the tips of the peduncles; rays 3 to 6, ½ to 1½ in. long (or reduced and then the umbels capitate), usually with a whorl of bracts at middle; involucres broadly campanulate, 3 to 5 lines long; calyx white,

fading pinkish, narrowed at base but not stipe-like, 3 to 4 lines long; filaments pilose on lower half.—Gravelly drifts and glaciated granite slopes and ridges, 7000 to 9500 ft.: Sierra Nevada on e. slope from Sierra Co. to Inyo Co., and w. slope from Nevada Co. to Tuolumne Co.; inner North Coast Range.

60. **E. pýrolaefòlium** Hook. Peduncles scape-like, glabrous, 2 to 3½ in. high, arising from a densely leafy caudex; leaves roundish or oval, thick, glabrous, 4 to 12 lines long, abruptly petioled, the petioles villous; umbels small, bearing 1 to 3 involucres on short (1 or 2 lines long) rays or quite capitate; bracts 2, linear or spatulate, elongated; calyx red, not attenuate at base, 1½ to 2 lines long, somewhat glandular inside, hairy at base outside and on midribs half-way up segments; filaments glabrous; upper part of ovary densely hairy.—High northern peaks: Lassen Peak; Mt. Shasta; n. to Mt. Rainier.

61. **E. laténtis** Jepson. Peduncles naked, 8 to 12 in. high from the short leafy branches of a woody caudex; leaves roundish, or somewhat deltoid-ovate, acutish, short pilose, 7 to 12 lines long, abruptly or cuneately narrowed at base to a margined petiole half to as long as the blade; involucres congested in a terminal head, membranous, campanulate, 3 to 4 lines long, with short broad sparsely hairy lobes; calyx white, its base appressed hairy, the inner segments narrower than the outer; lower third of filaments pubescent.—Desert slopes of Sierra Nevada in Inyo Co.; 6500 ft.

62. **E. ursìnum** Wats. Peduncles scape-like from a branching woody leafy crown or mat, 4 to 12 in. high, these and the umbels villous-tomentulose; leaves ovate, mostly acute, cordate at base, varying to cuneate, white-tomentose beneath, glabrate and greener above, 4 to 8 lines long, the petiole half to as long; umbel compound, sometimes simple, 3 to 10-rayed or reduced to a head-like cluster; bracts obovate to subfiliform, subtending the umbel and secondary umbels, usually also with a whorl at or near the middle of the rays or secondary rays; involucres campanulate-funnelform, large (3 to 3½ lines high), thin, hairy-pubescent outside, shortly and sharply toothed; calyx yellow or white, glabrous, abruptly campanulate above the stipe-like base, 2 to 3 lines long; filaments copiously woolly, the wool filling the base of the calyx.—High montane, 5000 to 8000 ft.: Sierra Nevada from Nevada Co. to Shasta Co.; Snow Mt., Lake Co.

63. **E. incànum** T. & G. Peduncles stout, tomentulose, 1 to 3½ in. high, arising from a matted densely leafy crown; leaves oblong to ovate or obovate, white-tomentose, the edges often disposed to be revolute, 3 to 6 lines long, mostly short-petioled; umbels with 4 or 5 rays 2 to 6 lines long or reduced to small dense heads; bracts few, linear; calyx yellow, often red, glabrous, 1 to 2 lines long, narrowed to a short stipe-like base; filaments sparingly hairy at base.—Gravelly slopes and peaks, Sierra Nevada, 7000 to 12,000 ft.: Farewell Gap and Mt. Whitney n. to Mt. Lyell and Mt. Ralston.

64. **E. marifòlium** T. & G. Peduncles scape-like, slender, 3 to 12 in. high, arising from a loosely branched leafy base; leaves oval or ovate, white-woolly or commonly glabrate above, 3 to 8 lines long, the petioles mostly as long or longer; umbels with 3 to 6 rays ½ to 2½ in. long, the central involucre sessile, or the umbel sometimes reduced to a small head; flowers often more or less dioecious, yellowish (reddish in age), glabrous, 1 to 1½ lines long.—Higher Sierra Nevada; Mt. Wilson. Differs from no. 63 in its looser growth and larger umbels.

65. **E. kellóggii** Gray. Peduncles rising from a loose mat, scape-like, slender, 2 to 4 in. high, naked save for whorl of 3 leaf-like bracts at the middle; mat consisting of branching stolon-like woody stems with the leaves in rosettes on the ends of short branchlets; herbage tomentulose throughout or the leaves glabrate above; leaves oblanceolate or narrowly obovate, narrowed to a short petiole, 2 to 5 lines long; involucre solitary, turbinate, 2 to 2½ lines long, with erect teeth; calyx whitish or pinkish, glabrous, stipe-like at base, 3 to 4½ lines long, its segments obovate, rounded at apex; filaments

pilose below middle.—Red Mt., Mendocino Co., not otherwise known. Remarkably similar in habit to the monocephalous forms of E. umbellatum.

66. **E. alpinum** Engelm. White-lanate dwarf, 1½ in. high, the scape-like stems with a whorl of bracts at the middle and ending in a single involucre; leaves roundish, 5 to 7 lines broad; involucre turbinate, 3 lines long, with minute teeth; calyx yellow, glabrous, 1½ to 2 lines long, the stipe-like base short, the segments obovate, obtuse; filaments slightly pubescent at base.—Mt. Eddy, Siskiyou Co., 8700 ft.

CHENOPODIÁCEAE. Saltbush Family

Herbs or shrubs, mostly salt-loving, very often succulent or scurfy, with alternate or rarely opposite leaves, or leafless. Flowers small (1 or 2 lines long), perfect or unisexual with an herbaceous calyx of 5 or fewer sepals, or in the pistillate flower the calyx sometimes absent. Stamens as many as the sepals and opposite them, or fewer, distinct or slightly united at base. Ovary superior, 1-celled, containing a single ovule, becoming in fruit an achene or utricle. Styles or stigmas 2 or 3. Embryo curved; endosperm copious or sometimes wanting. Nitrophila has a scarious calyx.

Leaves never spiny.
- Leaves not fleshy or scarcely so; embryo annular or curved, embracing or surrounding the central endosperm, or folded and the endosperm lacking.
  - Stems with foliaceous leaves.
    - Leaves opposite, united at base.....1. Nitrophila.
    - Leaves alternate, sometimes the lowest opposite, but never united at base.
      - Calyx not horizontally winged; leaves plane (except no. 9).
        - Flowers perfect, all of one kind.
          - Calyx 3 to 5-parted or -toothed.
            - Stamen 1; flowers axillary and solitary..2. Aphanisma.
            - Stamens 5 (or 4); flowers in clusters.
              - Calyx with a fleshy disk at base, the ovary partly sunk in it.....3. Beta.
              - Calyx without disk.
                - Calyx 5 (or 4)-parted, herbaceous or fleshy in fruit.....4. Chenopodium.
                - Calyx saccate, 3 to 5-toothed, dry in fruit..... 5. Roubieva.
          - Calyx of 1 sepal; stamen 1.....6. Monolepis.
        - Flowers unisexual, of 2 kinds, the staminate with calyx, the pistillate without calyx and enclosed by 2 appressed bracts.
          - Fruits not hairy; leaves not revolute.
            - Bracts distinct or more or less united, the margins never wholly united, at least partly free, the sides smooth or muricate.....7. Atriplex.
            - Bracts wholly united into an orbicular strongly flattened sac with a pin-hole orifice at apex..8. Grayia.
          - Fruits densely white-hairy; leaves linear revolute.9. Eurotia.
      - Calyx in fruit surrounded by a 5-lobed wing.....10. Kochia.
  - Stems with the leaves reduced to mere scales; flowers perfect or unisexual; stems fleshy, jointed.
    - Shrubs; scales alternate.....11. Allenrolfea.
    - Herbs; scales opposite.....12. Salicornia.
- Leaves more or less fleshy, soft; embryo spirally coiled, the endosperm lateral or none.
  - Flowers unisexual, the staminate in a catkin-like spike, the pistillate axillary.... 13. Sarcobatus.
  - Flowers perfect and pistillate, in axillary clusters.....14. Suaeda.

Leaves dry, rigid or spiny; flowers perfect; embryo spirally coiled.....15. Salsola.

1. NITRÓPHILA Wats.

A low perennial glabrous herb with fleshy opposite amplexicaul leaves and axillary perfect flowers. Sepals 5 (rarely 6 or 7), chartaceous, imbricated, concave and carinate. Stamens 5, united at base into a narrow yellowish disk. Style longer than the subglobose ovary; stigmas 2. Achene beaked by the persistent style, included within the connivent sepals. (Greek nitron, carbonate of soda, and philos, fond of, these plants loving alkaline soils.)

1. **N. occidentàlis** (Moq.) Wats. Fig. 336. Stems decumbent, oppositely branching, 4 to 14 in. long, from a deep-seated thick taproot; leaves linear, sessile, ½ to 1 in. long, the floral mostly 3 to 6 lines long, triangular in cross-section, mucronate; flowers solitary in the axils and bibracteate, or often 2 or 3 with the central one frequently bractless and the lateral shortly

336. Nitrophila occidentalis Wats.; *a*, fl. branchlet x 1; *b*, fl. x 6.

pediceled; sepals pinkish or whitish.—Moist alkaline soils, often on the black alkali: Sacramento Valley s. to S. and L. Cal.; desert side of the Sierra Nevada; Nev.; Ore.

2. **APHANÍSMA** Nutt.

Annual with alternate sessile entire leaves. Flowers minute, perfect, without bracts, axillary, solitary. Calyx 3 or 4-cleft, without appendages. Stamen 1. Ovary depressed, the short style 2 or 3-cleft. Achene depressed-globose, indurated, somewhat 5-angled, subtended at base by the closely appressed dry calyx. Embryo annular, surrounding the copious endosperm. (Greek aphanes, inconspicuous.)

1. **A. blitoìdes** Nutt. Branched at the base with slender ascending stems, ½ to 2 ft. high; leaves ovate, acuminate, cordate or truncate at the sessile base, ½ to 2 in. long, or the lowest lanceolate and long-petioled; achene ½ line broad.—Del Mar; San Diego; Carrizo Creek; Santa Barbara Islands.

3. **BÈTA** L.

Robust glabrous biennial herbs with large fleshy roots. Leaves alternate, large, long-petioled, the floral reduced and subsessile. Flowers perfect, protandrous, greenish white, in sessile axillary clusters; clusters 2 or 3-flowered, disposed in paniced spikes, the flowers cohering in fruit by the enlarged bases of the calyx. Calyx 5-parted, its lobes costate dorsally, in fruit indurated and closing over the achene. Stamens 5, perigynous; filaments frequently connate at base. Ovary sunk in the succulent base of the calyx; styles 2 or 3, short, stigmatose on the inside. Achene adnate to the calyx-base. Embryo annular. (Perhaps Celtic bett, red, on account of the color of the root.)

1. **B. vulgàris** L. Beet. Stems 2 to 6 ft. high, paniculately branched above; root conical; lower leaves 4 to 10 in. long, oblong or ovate, undulate, the upper smaller, ovate-lanceolate.—Garden plant, naturalized in marshes: Petaluma; Alvarado; Monterey; San Bernardino. Native of Eur. June.

4. **CHENOPÒDIUM** L. Goosefoot. Pigweed

Annual or perennial herbs, frequently white-mealy or glandular, with alternate petioled leaves. Flowers perfect, greenish, bractless and sessile, clustered, the clusters commonly in simple or paniced spikes. Calyx 5 (or 3 to 4)-parted, persistent and usually inclosing the seed-like achene, rarely reduced to a single sepal. Stamens 5 or fewer. Ovary depressed; styles 2,

rarely 3 or 4, slender. Achene with membranous pericarp closely investing the seed. Embryo annular, sometimes incompletely so. (Greek chen, goose, and pous, foot, on account of the shape of the leaves.)

Fruiting calyx dry.
- Annual; calyx deeply parted into lobes or segments.
  - Finely mealy, at least not pubescent or glandular.
    - Achene with pericarp closely persistent on seed.
      - Erect, herbage light green ..... 1. *C. album.*
      - Diffuse, herbage dark green ..... 2. *C. murale.*
    - Achene with pericarp separating readily from seed.
      - Leaves triangular-hastate, thin; petioles half as long as the blades or longer ..... 3. *C. fremontii.*
      - Leaves linear, thick; petioles short, less than ¼ as long as the blades. 4. *C. leptophyllum.*
  - Glandular-pubescent and aromatic, but not mealy.
    - Flower-clusters spicate or paniculate.
      - Leaves slender-petioled; achene imperfectly enclosed by calyx; spikes cymose-diverging, leafless ..... 5. *C. botrys.*
      - Leaves slightly petioled; achene perfectly enclosed by calyx.
        - Spikes dense, leafy ..... 6. *C. ambrosioides.*
        - Spikes more elongated, leafless ..... 7. *C. anthelminticum.*
    - Flower-clusters all axillary ..... 8. *C. carinatum.*
- Perennial; calyx merely toothed or cleft, more distinctly synsepalous; spike terminal, leafy only below; achene exserted ..... 9. *C. californicum.*

Fruiting calyx fleshy, often reddish; annual.
- Calyx deciduous ..... 10. *C. rubrum.*
- Calyx persistent, the clusters red and berry-like ..... 11. *C. capitatum.*

1. **C. álbum** L. White Pigweed. White Goosefoot. Erect, 2 to 4 ft. high, usually paniculately branched; herbage more or less light green or white-mealy; leaves rhombic-ovate, sinuate-dentate below or about the middle, the uppermost varying to lanceolate and subentire, 1 to 2 in. long, whiter beneath than above; flowers densely clustered in close spikes, the panicle strict and close or somewhat spreading; calyx about ¾ line wide in fruit, the lobes strongly carinate.—Common European weed in old fields or half-cultivated lands. July-Oct. Also well known as Lambs Quarters, the herbage making excellent boiled greens when taken young. Var. víride Moq. Leaves bright green on both sides or only slightly mealy beneath; inflorescence less dense.—Widely distributed but not so common as the species.

2. **C. murâle** L. Sowbane. Nettle-leaf Goosefoot. Rather stout and succulent, the loose branches decumbent and ascending, 8 to 15 in. long; herbage dark green, the growing parts very finely mealy; leaves rhombic-ovate, irregularly and sharply toothed above the base, 1 to 1¾ in. long; flowers in rather dense axillary or terminal spicate panicles; panicles leafless, or nearly so, often very small; fruiting calyx closed; achene acutely margined.—Naturalized from Eur.; a common weed in old yards and waste places, flowering through the winter.

3. **C. fremóntii** Wats. Erect, slender, branching, ½ to 2 ft. high; sparingly white-mealy to light green; leaves glabrous on upper surface, sparsely farinose beneath; flower-clusters in slender spikes of the open panicle; sepals strongly carinate; calyx sparsely farinose.—Panamint Mts.; e. to the Rocky Mts., n. to Ore.

4. **C. leptophýllum** Wats. Erect, ⅔ to 2½ ft. high, branches densely farinose, or becoming glabrate; leaves densely white-farinose, or glabrate on the upper surface; calyx densely farinose.—Barstow, Mohave Desert; n. to Alb., s. to Mex.

5. **C. bótrys** L. Jerusalem Oak. Erect, often widely branching, ½ to 2 ft. high, glandular pubescent and viscid throughout; leaves slender-petioled, ovate to oblong, ½ to 1½ in. long, obtuse, truncate or cuneate at base, sinuately pinnatifid and the lobes usually toothed; spikes cymose, diverging, leafless; calyx not completely inclosing the achene.—Waste places near dwellings and in flood stream beds; nat. from Eur. and widely distributed but not common. July-Sept.

6. **C. ambròsioides** L. Mexican Tea. Erect, 2 to 3½ ft. high, usually stout and branched; herbage glabrous, scarcely glandular, when young sometimes tomentose-pubescent; leaves slightly petioled, oblong or lanceolate, 2

to 5 in. long, repand-toothed or nearly entire, the upper tapering to both ends; flowers in dense axillary clusters upon the branches, forming a leafy spike; calyx-lobes obtuse, appressed, slightly carinate, completely inclosing the achene; styles 3, sometimes 4; pericarp deciduous; seed smooth and shining, reddish, obtusely margined.—Common near salt marshes and abundant along interior streams: Great Valley and Coast Ranges to S. Cal.; nat. from trop. Am.; mostly autumnal.

7. **C. ánthelmínticum** L. Wormseed. Very close to no. 6; sometimes biennial or perennial; herbage light green, glandular-puberulent and highly aromatic; leaves sinuate-serrate or the lower sometimes laciniate-pinnatifid, ¾ to 3 in. long; inflorescence a terminal mostly leafless panicle of dense but elongated slender spikes; sepals not carinate.—Not so common as the last, but appearing to hybridize with it: Coast Ranges and Sacramento Valley; nat. from trop. Am.

8. **C. carinàtum** R. Br. Stems several from the base, ascending or decumbent, 5 to 18 in. long; herbage puberulent, the under side of the leaves with minute resin-globules; leaves ovate, sinuate-crenate, 3 to 6 lines long, on slender petioles ½ to as long; flowers small, the clusters in all the axils; stamen usually 1.—Humboldt Co.; Hat Creek, e. Shasta Co.; Oroville; West Branch, Butte Co.; Ione; Jackson; Upland; Ontario; nat. from Austr.

9. **C. califórnicum** Wats. Soap Plant. Stout, erect or decumbent at base, 1½ to 2½ ft. high from a very large carrot-like root; herbage green, scarcely at all mealy; leaves broadly triangular, truncate or cordate at base, or subhastate, sharply and unequally sinuate-dentate, 1½ to 3½ in. long; flowers in dense clusters in a terminal spike, leafless or leafy at the very base; calyx campanulate, barely exceeding 1 line; achene with persistent pericarp, subglobose or somewhat compressed, exserted, ¾ to 1 line broad; embryo completely annular.—Stream beds and moist slopes or swales in open foothills: Coast Ranges; Sierra Nevada foothills; s. to San Diego Co. Apr.-May. The root is grated on a rock by the native tribes and used as a soap.

10. **C. rùbrum** L. Red Goosefoot. Stems angled, erect, 1 to 2 ft. high; herbage green or nearly so; leaves lanceolate-oblong to broadly ovate, coarsely sinuate, 1 to 2 in. long; flowers numerous in dense short axillary spikes; calyx-lobes 2 to 4, rather fleshy; stamens 1 or 2; achene shining, the margin acute.—Low and marshy lands: lower Sacramento River; Alvarado; Nigger Slough and Ballona, Los Angeles Co.; nat. from Eur. Sept.

11. **C. capitàtum** (L.) Asch. Strawberry Blite. Branched at base with erect or ascending stems 5 to 15 in. high; leaves hastate-triangular or -lanceolate, irregularly toothed or nearly entire, ¾ to 2 in. long, on margined petioles ½ to as long; flower clusters large, in interrupted spikes, leafy below; stamens 1 to 5; calyx berry-like in fruit.—Sierra Co.; Sisson; n. to Alas., e. to the Atlantic.

5. **ROUBIÈVA** Moq.

Heavy-scented herb, with prostrate branches. Leaves alternate, deeply pinnatifid. Flowers minute, perfect or pistillate, solitary or 2 or 3 together in the axils; calyx deeply bowl-shaped, 3 to 5-toothed, becoming saccate and contracted at the top, inclosing the fruit. Stamens 5, included. Ovary glandular at the top; styles 3, somewhat lateral, exserted. Pericarp of the achene membranous, glandular-dotted, thin and deciduous; seed lenticular; embryo annular. (G. J. Roubieu, French botanist.)

1. **R. multífida** (L.) Moq. Branches 1 to 2 ft. long; leaves ½ to 1¼ in. long; calyx in fruit obovate, very conspicuously reticulate-veined.—San Francisco sand-hills and in waste places e. to the Great Valley; nat. from Peru.

6. **MONÓLEPIS** Schrad.

Low annuals with alternate fleshy leaves. Flowers polygamous, clustered in the upper axils. Sepal 1, entire, bract-like, persistent. Stamen 1. Styles 2, filiform. Achene with thin pericarp. Embryo annular around copious

endosperm. (Greek monos, one, and lepis, scale, referring to the solitary sepal.)

Pericarp minutely pitted, adherent to the seed.....1. *M. nuttalliana.*
Pericarp minutely papillose, separating from the seed.....2. *M. spathulata.*

1. **M. nuttalliàna** (R. & S.) Wats. Herbage pale green; branched at the base, the many stems 5 to 10 in. high; leaves linear or lanceolate with a salient tooth on each side near the middle, ½ to 1 (or 1½) in. long, shortly petioled or the lower petioles elongated; flower clusters dense, often reddish; sepal fleshy, foliaceous, often much exceeding the achene; pericarp minutely pitted, ½ line broad.—Alkaline soil, infrequent but widely distributed: S. Cal. to the Sacramento Valley and n. Sierra Nevada; e. to the Great Plains. Apr.-May.

2. **M. spathulàta** Gray. Habit of no. 1; leaves oblanceolate or spatulate, entire, ½ to 1 in. long; sepal rarely exceeding the achene.—Sierra Nevada from Sierra Co. to Mono Pass; Panamint Mts.; San Bernardino Mts.

Spinàcia L. Glabrous annual herbs. Flowers dioecious, in subglobose glomerules, the pistillate axillary, the staminate in interrupted terminal spikes. Pistillate flowers subtended by 2 bracts, these united except at apex and inclosing the utricle, often developing two opposite divergent spines below the apex. Stigmas 4 or 5, united at base, long-exserted. S. OLERÀCEA L. Spinach. Erect, 1 to 1½ ft. high; leaves triangular-ovate, hastate, 1 to 2½ in. long; fruiting bracts 2 lines long.—European garden plant, occasionally escaped from cult. (San Jose).

7. ÁTRIPLEX L. Saltbush

Herbs or shrubs, usually mealy or scurfy with bran-like scales. Leaves alternate or opposite. Flowers monoecious or dioecious, in axillary clusters, or in simple or panicled spikes; staminate flowers with a regular 4 or 5-parted calyx, the pistillate consisting of a pistil inclosed between a pair of appressed foliaceous bracts, without calyx. Styles 2. Bracts either free or united, much enlarged in fruit, the margin usually becoming more or less expanded or foliaceous and the sides thickened, indurated, muricate or variously appendaged. (The ancient Latin name.)

A. Herbs; monoecious.

1. Staminate and pistillate flowers usually mixed in the same cluster; annuals (except no. 11).

Somewhat succulent and mealy; leaves petioled, the lower at least 1 in. long; bracts distinct or nearly so, ovate to rhombic.
Lower leaves opposite; flowers in naked or nearly naked spikes; mostly coastal.
Leaves mostly lanceolate; fruiting bracts 4 to 6 lines long.....1. *A. patula.*
Leaves triangular-hastate or deltoid; fruiting bracts 1½ to 2 lines long.....2. *A. hastata.*
Leaves all alternate; interior species.
Leaves triangular-ovate; flowers in naked spikes; fruiting bracts 1 line long...3. *A. spicata.*
Leaves rhomboidal-hastate; flowers in axillary clusters; fruiting bracts 3 to 4 lines long.....4. *A. phyllostegia*
Not succulent, commonly whitish-scurfy; bracts more or less united and indurated and nut-like in fruit, the margins partly or wholly free, the sides smooth, toothed or appended; flower clusters axillary; mostly small plants except no. 11.
Stems woolly-pubescent, the branches opposite throughout or mostly so; prostrate plant; leaves mostly less than 1½ lines long.....5. *A. parishii.*
Stems scurfy or glabrate but not woolly, the branches alternate, at least above the base; leaves small, 3 to 6 (or 10) lines long; fruiting bracts ½ to 2 lines broad.
Fruiting bracts gray or dull green.
Decumbent plants.
Bracts narrowly margined at summit with 3 to 5 small herbaceous teeth.....6. *A. microcarpa.*
Bracts narrowly margined and denate all around ..7. *A. saltonensis.*
Erect or ascending plants.
Fruiting bracts with the margin toothed above the entire base.
Leaves cordate-ovate, sessile.....8. *A. cordulata.*
Leaves oblong-lanceolate to ovate, short petiolate or mostly sessile.
9. *A. coronata.*
Fruiting bracts circular, with a toothed margin all around.....
10. *A. elegans.*
Fruiting bracts red, slightly succulent; diffuse perennial....11. *A. semibaccata.*

2. Staminate flowers in terminal naked spikes, the pistillate in axillary clusters.

Annuals; spikes usually moniliform; leaves mostly ½ to 1 in. long or less (except no. 14); commonly tall plants.
Plants erect, or mostly so, 2 to 3 ft. high.
Leaves oblanceolate or lanceolate; fruiting bracts 1 line broad...12. *A. coulteri.*
Leaves broadly or deltoid-ovate; fruiting bracts 2½ to 3 lines broad.
Staminate spikes short, dense.....13. *A. argentea.*
Staminate spikes elongated, interrupted.....14. *A. expansa.*
Plants decumbent; fruiting bracts triangular.....15. *A. decumbens.*
Perennials.
Interior species of alkaline flats; bracts toothed; spikes often moniliform.
Diffuse; leaves mostly sharply dentate.....16. *A. bracteosa.*
Erect and rather rigid; leaves entire.....17. *A. fruticulosa.*
Sea-beach species; bracts entire; spikes usually dense.
Stems prostrate, wiry; fruiting bracts membranous, compressed.18. *A. californica.*
Stems reclining, stout; fruiting bracts spongy, globose.....19. *A. leucophylla.*

B. Shrubs, or at least suffrutescent; dioecious.

Fruiting bracts without lateral wings.
Sides of fruiting bracts smooth, the margins entire or with very low teeth.
Fruiting bracts large, their margins free and more or less divergent.
Leaves entire, sessile or nearly so; fruiting bracts ovatish.
Fruiting bracts 3 to 5 lines long; leaves not cordate.....
20. *A. confertifolia.*
Fruiting bracts 1 to 1½ lines long; leaves cordate.....21. *A. parryi.*
Leaves coarsely toothed, petioled; fruiting bracts orbicular.....
22. *A. hymenelytra.*
Fruiting bracts small, their margins not divergent.
Branches terete; bracts united about to middle or above; axes of spikes filiform, pliable.
Bracts flattened, obscurely crenate; desert.....23. *A. lentiformis.*
Bracts convex, entire; coast.....24. *A. breweri.*
Branches striate-angled; bracts distinct but closely compressed; axes of spikes stouter, rigid.....25. *A. torreyi.*
Sides of fruiting bracts crested or muricate, the margins laciniate or toothed.
Bracts flattened, united about ⅓.....26. *A. polycarpa.*
Bracts thickish, spongy, united nearly to apex.....27. *A. nuttallii.*
Fruiting bracts with 4 very conspicuous longitudinal wings or crests.
Wings crest-like, about 1 line broad.....28. *A. linearis.*
Wings roundish, 3 to 5 lines broad.....29. *A. canescens.*

Sect. I.—Herbs with pistillate and staminate flowers on the same plant; annuals (nos. 1 to 10 and 12 to 15) or perennials (nos. 11 and 16 to 19).

1. **A. pátula** L. Spear Orache. Stout and succulent, erect, 10 to 18 in. high, with few ascending branches; herbage green, only the growing parts somewhat mealy; leaves (the lowest often opposite) lanceolate or linear, sometimes with hastate base; inflorescence more or less leafy at base; fruiting bracts rhombic- or lance-ovate, thick and subcoriaceous, united at base, 4 to 6 lines long, entire or toothed, the sides smooth or muricate.—Common in salt marshes along the coast; S. Cal. to San Francisco Bay and n. to B. C.; seacoasts of n. hemisphere.

2. **A. hastàta** L. Fat-hen. Rather slender, with long (1 to 2½ ft.) ascending branches; herbage mealy, scarcely succulent; leaves triangular-hastate or deltoid, entire or sinuate-dentate, 1 to 2 in. long, often as broad or broader, on petioles 3 to 4 lines long; flowers in dense terminal and lateral spikes 1 to 4 in. long; fruiting bracts orbicular or triangular-ovate, 1½ (or 2) lines long, united at the cuneate base, the sides mostly toothed-crested. —Common in salt marshes about San Francisco Bay and n. to Wash.; Atlantic seacoast; Eur. Bracts very variable as to size and either much or little toothed, or entire. Lateral angles of the deltoid leaves often prolonged into salient lobes.

A. rósea L. Annual; leaves all alternate, ovate, sinuate-dentate, densely scurfy, often turning red; flowers mostly in axillary capitate clusters, some in terminal spikes; bracts rhombic- or cuneate-orbicular, the margin dentate, the sides warty.—Yolo Co.; Los Angeles coast; native of Eur.

3. **A. spicàta** Wats. Erect, 9 to 16 in. high; herbage scurfy, the stem below glabrate; leaves triangular-ovate, irregularly dentate or entire, cuspidate, 1 to 2 in. long, on petioles 1 to 6 lines long; flowers in a panicle of usually dense naked spikes; staminate calyx 4-parted; pistillate flowers nearly concealed by the staminate flowers; bracts in fruit little enlarged,

ovate, acute, united to the middle or above, the apex free, the sides smooth or slightly ridged, 1 to 1½ lines long.—Low alkaline tracts of the interior valleys: Sacramento, San Joaquin and Santa Clara valleys. Occasionally exhibits a tendency to become dioecious.

4. **A. phýllostègia** Wats. Bushy-branching, 4 to 13 in. high; herbage finally glabrous, inclined to be reddish; leaves rhomboidal-hastate with acuminate lobes, ¾ to 1¼ in. long, shortly petioled or subsessile, the blade entire, often almost as broad as long; fruiting bracts ovate or lanceolate, 4 lines long, abruptly and somewhat reniformly enlarged at base with 2 (or 4) tubercles or short ridges on the sides.—Mohave Desert; upper San Joaquin Valley; Owens Valley; e. to Nev.

5. **A. parishii** Wats. Prostrate, grayish-scurfy and slightly pubescent; stems slender, 1 to 4 in. long, densely foliaceous; leaves opposite, sessile, broadly ovate, acute, 1 to 2 (or 4) lines long; fruiting bracts ovate-hastate, acute, wingless, or the pair of hastate lobes representing the wing.—Low saline spots: Solano Co.; Redondo; Orange Co.; Palm Sprs.

6. **A. microcárpa** (Benth.) Dietr. Freely branching with very slender decumbent nearly glabrous branches 3 to 12 in. long; leaves thin, obovate, acute at base, abruptly acute at apex, slightly scurfy, 3 to 5 lines long, sessile or subsessile; fruiting bracts 1 line broad, the margins parallel above the acutish base and united nearly to the 3 (or 5)-toothed truncate summit, the convex sides 1 to 3-nerved, smooth or muricate.—San Pedro; San Diego; Santa Cruz and San Clemente Isls.; L. Cal.

7. **A. saltonénsis** Parish. Stems somewhat decumbent, very leafy, 4 to 6 in. broad; herbage scurfy; leaves ovate to obovate, 3 to 5 lines long, shortly petioled; flowers axillary; bracts orbicular, 1 to 1½ lines broad with narrow margin dentate all around.—Mecca, Colorado Desert; not otherwise known.

337. A. cordulata Jepson; fr. bracts x 4.

8. **A. cordulàta** Jepson. Fig. 337. Erect, the simple stems or branches commonly virgate, 7 to 15 in. high, scurfy; leaves somewhat crowded, cordate-ovate, sessile, 3 to 4 lines long; calyx 4-parted; fruiting bracts fan-shaped or somewhat rhomboidal, 1½ to 2 lines broad, much compressed, pedicellate, the margin denticulate above the middle, the terminal tooth commonly the largest, sides smooth or bearing one or more tooth-like projections.—Alkaline flats, Sacramento and San Joaquin valleys. Var. TULARÉNSIS Jepson. More slender, taller (up to 2¼ ft.), the leaves remoter, ovate and acuminate or lanceolate; fruiting bracts 1 line broad.—Bakersfield plain.

9. **A. coronàta** Wats. Branching at the base, 3 to 12 in. high, sometimes rather stout, white-scurfy throughout; leaves oblong-lanceolate or ovate, sessile, 3 to 8 lines long; calyx 4-parted; fruiting bracts somewhat fan-shaped, compressed, 2 lines long and as broad, the margins crenate-dentate above the middle, the sides rarely muriculate.—Saline flats: Solano Co. to Santa Clara Co. May-June. Var. NOTÀTIOR Jepson. Sides copiously toothed-crested, the fruits thus globose in outline.—San Jacinto Valley.

10. **A. élegans** (Moq.) Dietr. var. **fasciculàta** (Wats.) Jones. Fig. 338. Scurfy, 3 to 10 in. high, with many ascending stems from the base; leaves obovate, usually entire, 4 to 10 lines long, sessile or the lowest petioled; fruiting bracts round, compressed, 1 to 1¾ lines broad, the somewhat convex center margined all around, the margin regularly and minutely toothed, the sides smooth.—Mohave Desert and Inyo Co. (A. fasciculata Wats.)

338. A. elegans var. fasciculata Jepson; fr. bracts x 4.

11. **A. semibaccàta** R. Br. AUSTRALIAN SALTBUSH. Diffusely spreading perennial, the stems 2 to 3 ft. long, woody below; leaves oblong, sinuate-toothed or entire, ½ to 2 in. long; fruiting bracts rhomboidal, acute, stipe-like at base, united about one-half, toothed at the lateral angles, 2 to 3 lines long, smooth on the 3-nerved sides.— Cult. as a forage plant and

becoming spontaneous: Marin Co.; San Joaquin Co.; San Diego Co.; Colorado Desert; native of Austr.

12. **A. coúlteri** Dietr. Erect with very slender branches, 1 to 3 ft. high, or sometimes diffusely spreading, the very base woody; leaves oblanceolate or lanceolate, ½ to 1 in. long, entire, mucronate, sessile or the lowest petioled; fruiting bracts roundish, 1 line broad, with a narrow herbaceous laciniately toothed border, which reaches nearly to the base, the convex sides reticulate-veiny, smooth or rarely muricate.—Near the coast: Santa Catalina Isl.; San Diego Co.; s. to L. Cal.

13. **A. argéntea** Nutt. SILVER ORACHE. Erect, branching, ½ to 1½ ft. high, gray-scurfy or glabrate, the upper side of the leaves greener; leaves triangular-ovate or subhastate-ovate, acute, dentate or entire, ¾ to 1 in. long, shortly petioled, or the upper sessile; flowers in axillary clusters, the staminate in the upper axils or in spikes; fruiting bracts roundish, spongy-thickened, 3 lines long, with an herbaceous irregularly toothed margin above the short turbinate or pedicellate base, one or both the sides with herbaceous teeth or lamellae.—E. side of the Sierra Nevada from Inyo Co. to Siskiyou Co.; n. to Wash., e. to the Rocky Mts.

14. **A. expánsa** (D. & H.) Wats. FOG-WEED. Erect, much branched, 2 to 3½ ft. high; finely mealy-scurfy; leaves broadly ovate or deltoid-ovate, irregularly and sharply toothed or entire, 1 to 3 in. long, often as broad as long, the lower on stout petioles, 1 to 10 lines long and 3-nerved from the base, the upper reduced to sessile and more or less cordate floral bracts as broad as (or broader than) long; spikes elongated, slender; fruiting bracts sessile, roundish, mostly 3-nerved, 2 to 3 lines broad, the margin sharply toothed, the sides smooth or with a few irregular projections or crests.—Low alkaline areas of the interior: Sacramento and San Joaquin valleys, s. to S. Cal.; e. to N. Mex.

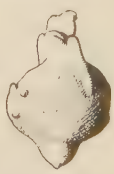
15. **A. decúmbens** Wats. Stems trailing, 1 to 3 ft. long; leaves alternate or the upper mostly opposite, finely hoary, ovate, 4 to 9 lines long, sessile; fruiting bracts triangular, truncate at base, 3 to 4 lines long, nearly as broad, united to the middle, the sides smooth; margins denticulate, their lower ¼ united.—Coast from San Diego to Long Beach; Santa Catalina Isl.

16. **A. bracteòsa** Wats. More or less diffuse, the stems 1 to several ft. long; branches smooth and shining, straw-color; leaves finely grayish-scurfy, greener above, oblong-ovate, mucronate-acute, or acuminate, ½ to 2 in. long, thin, sharply but sparingly toothed or the smaller entire; fruiting bracts whitish, 1 to 1½ lines long, the herbaceous margin laciniately toothed, or simply dentate with the central tooth lanceolate and conspicuous.—Moist saline soil, Great Valley to S. Cal. Aug.-Oct.

339. A fruticulosa Jepson fr. bracts x 4.

17. **A. frùticulòsa** Jepson. Fig. 339. Stems several from the base, erect, simple below, with terminal branchlets, 6 to 13 in. high, slightly woody at base; herbage grayish; leaves sessile, lanceolate or narrowly oblong, ¼ to ¾ in. long; fruiting bracts 1½ to 2 lines long and about as broad, the margins toothed above the base, the sides tooth-crested.—Alkaline flats of the Great Valley from the "goose-lands" of Glenn Co. to the San Joaquin.

18. **A. califórnica** Moq. Stems from a fleshy fusiform root, slender, wiry, mostly herbaceous, prostrate, often much branched and forming a thick mat; herbage finely white-mealy, but the general hue mostly greenish; leaves thinnish, ovate-lanceolate to oblong-lanceolate, 2 to 7 lines long, sessile or shortly petioled; flowers in mixed axillary clusters, or the staminate mostly in terminal spikes; fruiting bracts membranous, ovate, acute, entire, loosely closed over the utricle, but not united, 1 to 2 lines long.—Sandy beaches or bluffs along the coast: Marin Co. to San Diego and L. Cal. Apr.-May.



340. A. leucophylla Dietr.; fr. bracts x 4.

19. **A. leucophýlla** Dietr. Fig. 340. Stems prostrate, often somewhat woody at base, 1 to several ft. long, the branches

usually many, short, ascending, very leafy often almost imbricated-leafy; herbage densely scurfy, light brown, sometimes pinkish; leaves thick, orbicular to elliptic or elliptic-ovate, entire, 4 to 8 (or 12) lines long, sessile, 3-nerved; calyx rather large, 5-cleft; fruiting bracts subglobose, 1½ to 2 lines long, with the bracts completely united and marginless (except at the apex where there is a small ovate double wing) and the sides commonly with two (or several) warty projections. — Seabeaches, very common: San Francisco to S. Cal. June-Dec.

341. Atriplex confertifolia Wats.; fr. bracts x 4.

Sec. II.—Shrubs, or at least woody at base, with staminate and pistillate flowers on different plants.

20. **A. confértifòlia** Wats. SHEEP-FAT. SPINY SALTBUSH. Fig. 341. Compact round bushes 1 to 2 ft. high, more or less spiny; flowers in subpaniculate spikes, in fruit very dense; leaves ovate or elliptic, entire, rounded at apex, abruptly cuneate at base, 3 to 8 lines long, very shortly petioled; fruiting bracts sessile, round-ovate or subdeltoid, acutish or mostly obtuse, truncate or subcordate at base, 4 to 10 lines long, entire or sometimes dentate, united around the seed, the dilated margins otherwise free and more or less spreading, the sides smooth.—Common on desert mesas and hills: Mohave Desert; n. to Inyo and Lassen Cos.; e. to Col., s. to Mex.

342. A. parryi Wats.; fr. bracts x 4.

21. **A. párryi** Wats. PARRY SALTBUSH. Fig. 342. Densely branching white-scurfy rounded bush 8 to 16 in. high, near the preceding but the rigid spinosely tipped branches more numerous and slenderer; leaves thick, round-cordate, obtuse or acute, sessile, 2 to 6 lines broad; flower-clusters axillary; fruiting bracts very small (¾ to 1½ lines long), somewhat fan-shaped, united to above the middle, abruptly dilated above the broadly cuneate base, the free margin short but broad and with a few low teeth, the sides smooth.—Mohave Desert and Inyo Co.; e. to southern Nev.

22. **A. hỳmenélytra** (Torr.) Wats. DESERT HOLLY. Fig. 343. Compactly branching, 1 to 3 ft. high, the stems from thickened and often very gnarled woody bases 1 in. in diameter; herbage covered with dense smooth silvery-white scurf; leaves roundish, ½ to 1¾ in. broad, somewhat cordate at base, the undulate margin with coarse salient teeth, the petioles 3 to 6 lines long; flower clusters in panicled spikes; fruiting bracts on a short clavate pedicel, round-reniform, strongly flattened, entire, 2½ to 6 lines broad, distinct or nearly so, the margins entirely free and sides smooth. —Colorado and Mohave deserts; Owens Valley; e. to Utah. Also called Silver Holly.

343. Atriplex hymenelytra Wats.; fr. bracts x 4.

23. **A. lentifórmis** (Torr.) Wats. QUAIL BRUSH. Fig. 344. Widely spreading shrub 6 to 10 ft. high and half again as broad; branches divaricate, occasionally spinescent; herbage closely scurfy; leaves ovate or triangular-hastate, rounded at apex, ½ to 1½ in. long, on short petioles; fruiting spikes dense, naked, pliable, in compact panicles, 4 to 8 in. long; calyx 5-cleft; fruiting bracts roundish, flattened, 1 to 2 lines broad, united by their edges to the middle or above, the sides smooth and the free margins obscurely crenulate.—Alkaline flats and river benches: upper San Joaquin Valley; Mohave and Colorado deserts; e. to Ariz.

344. Atriplex lentiformis Wats.; *a*, fr. branch x ¾; *b*, fr. bracts x 3.

24. **A. bréweri** Wats. Very near preceding, 4 to 6 ft. high; calyx 4-cleft; fruiting bracts spongy, drab-color, rounded, somewhat convex, united to near the middle, entire, 1½ to 3 lines broad.—Coast from Santa Barbara to Santa Monica and San Juan Capistrano; Santa Cruz Isl.

25. **A. tórreyi** Wats. WATER SAGE. Leafy bush 2 to 5 ft. high, densely and divaricately branched, the branches striately angled, becoming spiny with the lateral axes of the old panicles; leaves ovate-hastate or broadly oblong, ½ to 1½ in. long on petioles 1 to 4 lines long; flowers in narrow panicles; fruiting bracts roundish or transversely elliptic, 1½ to 2 lines broad, distinct, strongly compressed, with denticulate (sometimes smooth) margins and smooth veiny sides.—Alkaline desert flats: Mohave Desert and Inyo Co., e. to Utah; apparently also w. side San Joaquin Valley. Also called Nevada Saltbush.

26. **A. polycárpa** (Torr.) Wats. CATTLE SPINACH. Fig. 345. Light-gray shrub 2 to 3½ ft. high, with slender rigid branches and numerous more or less spiny branchlets; leaves thick, obovate to oblong-spatulate, obtuse, sessile, those of the vegetative branches 4 to 7 or 10 lines long, deciduous during the high heat period, those of the fruiting branches very small (1 to 4 lines long), with smaller ones fascicled in the axils; flowers in close naked panicled spikes; fruiting bracts roundish, united about ⅓, 1 to 2 lines broad, commonly broader than long, laciniately or unequally toothed, the sides with 2 or more slender spreading teeth or tubercular crests or sometimes quite smooth.—Desert bottoms and flats and river benches: Colorado and Mohave deserts, n. to the San Joaquin Valley and Inyo Co.: e. to Ariz.

345. A. polycarpa Wats.; fr. bracts x 4.

27. **A. nuttállii** Wats. SALT SAGE. Diffuse shrub 1 to 2 ft. high; leaves obovate to oblong or linear, entire, narrowed to a short petiole or sessile, 1 to 2 in. long; flowers in sparingly naked panicled spikes; fruiting bracts ovate, convex, united except at apex, 2 to 5 lines long, sessile or raised on a pedicel 2 lines long, the margin commonly 3-toothed at apex, the middle tooth often largest and the lateral small or wanting, the sides irregularly and often copiously tooth-crested.—Interior desert plains: Lassen Co.; e. to the Rocky Mts. Also called Nuttall Saltbush.

28. **A. lineàris** Wats. Shrub, more woody than A. nuttallii; leaves linear or narrowed towards the base, ½ to 1½ in. long; staminate flowers in small globose clusters, in simple or panicled spikes, leafy below; pistillate flowers solitary or few together in similar spikes, more leafy; fruiting bracts lanceolate or ovate, 2 to 4 lines long, prolonged above into a narrow tip, the sides irregularly tuberculate or crested and developing 4 deeply toothed wings.—Colorado Desert; s. to Mex.

29. **A. canéscens** James. SHAD-SCALE. Fig. 346. Roundish gray shrub 1 to 5 ft. high; leaves linear, entire, narrowed at base, ¾ to 1¼ in. long, finely scurfy-canescent; flowers mostly dioecious in elongated narrow spike-like panicles, very dense in fruit; fruiting bracts forming a thick hard body 2 to 4 lines long, tipped at apex with 2 lanceolate teeth 1 line long and

346. Atriplex canescens James; fr. bracts x 4.

laterally margined by 4 roundish very conspicuous wings 3 to 6 lines long and 2 to 4 lines broad; wings decurrent at base on the pedicel and overtopping the free apex, the margin irregularly dentate or laciniate.—Desert flats or washes; Mohave and Colorado deserts, w. to San Bernardino and San Diego; e. to Nev. and South Dakota, s. to Mex. It is very abundant in the Colorado Desert where it occupies a position similar to that of A. confertifolia in the Mohave Desert. Var. LÁCINIÀTA Parish. Wings 3 or 4 lines broad, saliently laciniate. — Colorado and Mohave deserts. Var. MACILÉNTA Jepson. Wings much reduced, ¾ to 1½ lines broad, coarsely toothed.—Colorado Desert.

8. GRÀYIA H. & A.

Low shrubs with alternate entire leaves. Flowers dioecious or sometimes monoecious, in axillary clusters or terminal spikes. Staminate flowers without bracts; calyx mostly 4-parted; stamens 4 or 5, with short subulate filaments. Pistillate flowers without calyx, the ovary inclosed in an orbicular strongly flattened membranous sac with a small orifice at the apex and bordered all around with a narrow wing, this sac really composed of 2 conduplicate bracts united by their edges nearly to the apex, each bract with a wing developed on the back or midrib, the whole much enlarged in fruit. Styles 2. Achene with very thin pericarp. (Asa Gray, 1810-1888, distinguished American botanist.)

1. **G. spinòsa** (Hook.) Moq. HOP SAGE. Fig. 347. Deep green shrub 1¼ to 3 ft. high, the branches frequently spinescent; young parts mealy, finally glabrous; leaves rather fleshy, linear-oblanceolate or obovate, 4 to 15 lines long, barely petioled; staminate flowers in axillary clusters, the pistillate mostly spicate; fruiting bracts round, 3 to 6 lines in diameter, sessile, entire, glabrous, thin, white or pinkish, emarginate, abruptly narrowed below to a short cuneate pedicel-like base or the pedicel often obscure or obsolete; styles slender, at first exserted. —Alkaline valleys: Mohave Desert; Owens Valley; n. to Wash., e. to Wyo.

347. Grayia spinosa Moq.; fr. branchlet x 1.

9. EURÒTIA Adans.

Low white-tomentose shrubs with alternate entire leaves. Flowers dioecious or monoecious, in small axillary clusters, the clusters spicately disposed at the ends of the branches. Staminate flowers without involucral bracts; calyx hairy, 4-parted; stamens 4, exserted. Pistillate flowers without calyx; pistil inclosed in a membranous densely silky-hairy sac composed of two bracts united above the middle and with spreading apices; styles 2, slender, exserted. Sac in fruit enlarged, 4-angled, beaked above by two short horns. (Greek euros, mould, referring to the hairy or rufous covering.)

348. Eurotia lanata Moq.; fr. branchlet x 1.

1. **E. lanàta** (Pursh) Moq. WINTER FAT. Fig. 348. Branches slender, usually many from the woody stems, 1 to 2 ft. high, the herbage stellately white-tomentose or in age reddish; leaves linear with strongly revolute margins, ¾ to 1¼ in. long or the axillary fascicled ones mostly 1 to 6 lines long; fruiting involucre 2 or 3 lines long, ornamented with 4 dense spreading tufts of silvery-white hairs; ovary densely white-hairy. — Subalkaline soils: Mohave Desert; upper San Joaquin Valley and neighboring inner Coast Range; Inyo Co. to Honey Lake Valley; n. to Wash. and Saskat., e. to N. Mex. Often abundant in the desert valleys and prized by the cattlemen for winter forage; they sometimes call it "White Sage" or "Sweet Sage."

10. KÒCHIA Roth

Perennial herbs, woody at very base. Leaves linear, terete, entire. Flowers perfect, solitary or few in the axils of the virgate leafy stems, without bracts. Calyx herbaceous, subglobose, shortly 5-lobed, persistent over the fruit, and finally developing 5 horizontal wings. Stamens 5, usually exserted. Ovary depressed; styles 2 or 3, filiform. Achene with membranous persistent pericarp. Embryo nearly annular, green; endosperm none. (W. D. J. Koch, one time Director of the Botanic Garden at Erlangen.)

1. **K. americàna** Wats. RED SAGE. Stems many from the branching crown of a woody root, erect, 5 to 11 in. high; stems whitish-tomentulose, the leaves silky-pilose, both finally glabrate and greenish; leaves ascending, narrowly linear, 4 to 7 lines long, ascending or strict; calyx densely white-tomentose or partly glabrate; wings fan-shaped, membranous, striate, toothed or erosulate, 1 line long.—Desert valleys: Honey Lake Valley; Inyo Co.; e. to Col. Var. CALIFÓRNICA Jones. Six to 15 in. high; herbage grayish or rusty; leaves spreading, narrowly oblong, 2 to 6 lines long.—San Joaquin Valley; Mohave Desert; e. to southern Nev.

11. ALLENRÓLFEA Ktze.

Shrub with alternate leafless jointed branches; the branchlets fleshy and green with short scale-like leaves. Flowers perfect, arranged spirally by threes in a crowded spike, in the axils of fleshy subsessile bracts. Calyx of 4 (or 5) concave carinate imbricated sepals, more or less united. Stamens 1 or 2, with slender filaments at length exserted. Ovary oblong; styles 2, rarely 3, commonly distinct. Achene with membranous pericarp, free from the vertical oblong seed. Embryo green, nearly surrounding the rather copious endosperm. (Allen Rolfe, Kew botanist.)

1. **A. occidentàlis** (Wats.) Ktze. IODINE BUSH. Fig. 349. Erect, diffusely branched, 2 to 4 ft. high; vestiges of leaves very short, broadly triangular and amplexicaul, acute, often nearly obsolete; spikes numerous, sessile or nearly so, cylindrical, 3 to 10 lines long; bracts rhomboidal; flowers crowded, slightly exserted; calyx becoming spongy

349. Allenrolfea occidentalis Ktze.; fl. spikes x 1.

and inclosing the fruit.—Moist alkaline clay soil: San Joaquin Valley; Inyo Co.; e. Mohave Desert; e. to Tex. (Spirostachys occidentalis Wats.)

12. **SALICÓRNIA** L. Samphire. Glasswort

Low very succulent herbs with jointed stems and opposite terete branches. Leaves reduced to mere opposite scales at the nodes, the flowers immersed in the axils of the scales of the thickened upper joints and forming a cylindrical spike. Flowers disposed in opposite clusters of 3, perfect or unisexual. Calyx small and bladder-like, with an anterior opening, in fruit spongy and deciduous. Stamens 2, exserted in flower. Ovary oblong; styles 2 or 3, short. Achene with membranous pericarp, adherent to the seed. Embryo folded, the cotyledons incumbent upon the caulicle; endosperm none or almost none. (Latin sal, salt, and cornu, horn, plants of saline habitat with horn-like branches.)

Perennial by rootstocks; flowers of a trio all of the same height.
Spikes slender, narrower than stems.....1. *S. ambigua.*
Spikes rather thicker than stems.....2. *S. subterminalis.*
Annuals; middle flower higher than the lateral.
Joints of spikes longer than broad.....3. *S. europaea.*
Joints of spikes broader than long.....4. *S. mucronata.*

1. **S. ambígua** Michx. Pickle-weed. Fig. 350. Stems erect, or decumbent and rooting at the joints, 5 to 12 in. long, from woody rootstocks; herbage greenish; internodes rather long; spikes slender, about 1½ lines thick, usually narrower than the stem, all the scales flower-bearing to the top; achene pubescent.—Salt marshes along the coast: s. to L. Cal., n. to B. C.; Atlantic coast. (S. pacifica Sta.) Var. utahénsis Jepson. Spikes thicker (about 2 lines thick.)—W. base Panamint Mts. (S. utahensis Tidestrom.)

350. Salicornia ambigua Michx.; *a*, infl. x 1; *b*, staminate spike x 2; *c*, pistillate spike x 2.

2. **S. subtérminàlis** Parish. Stems widely spreading or erect and compact, ½ to 1 ft. high, from running rootstocks; internodes short; branchlets very numerous, each pair often turned to one side, giving the stem a unilateral appearance; spikes 1 to 2 in. long, of few to several enlarged broad flower-bearing scales and terminated by about as many long slender sterile ones; achene glabrous.—Coastal S. Cal., n. to the upper San Joaquin Valley.

3. **S. europaèa** L. Erect compactly branching annual 3 to 9 in. high; spikes slender, 1 line wide, mostly tapering toward tip, the joints much longer than broad; scales with blunt or very shortly acute tips; middle flower much higher than the lateral, shorter than the joints; fruiting calyx with raised spongy margin about a central crest.—Alkaline marshes, chiefly in the desert region: San Diego; Tehachapi Valley; Palo Alto; Modoc Co.; Atlantic Coast, Eur., Asia.

4. **S. mucronàta** Bigel. Habit of no. 3; spikes thick-cylindric, 2½ to 3 lines broad, not tapering, the joints broader than long; scales with acuminate tips; middle flower half higher than the lateral, occupying the whole joint; fruiting calyx with flattish anterior face.—San Diego; e. to the Atlantic.

13. **SARCOBÀTUS** Nees

Rigid and divaricately branched compact shrub with somewhat thorny branches. Leaves alternate, linear, sessile, entire. Flowers monoecious or dioecious, without bracts. Staminate flowers in terminal catkin-like spikes without calyx and with spirally arranged scales; stamens 2 to 5 under a stipitate peltate scale; filaments short. Pistillate flowers axillary and commonly solitary, sessile; ovary set in a sac-like adherent calyx; style short; stigmas 2, spreading horizontally; calyx laterally margined by a narrow border which becomes in fruit a broad circular horizontal wavy membranous wing. (Greek sarx, flesh, and batos, thicket.)

1. **S. vérmiculàtus** (Hook.) Torr. Black Greasewood. Fig. 351. Branches closely interlocking, 3 to 5 ft. high; bark white; leaves ½ to 1¾ in. long, fleshy, flat on the upper side, rounded beneath, usually glabrous; staminate

351. Sarcobatus vermiculatus Torr.; *a*, staminate inflor. x 1; *b*, pistillate inflor. x 1; *c*, fr. x 4.

spikes 7 to 10 lines long; fruiting calyx with prominently veined wing, 4 to 6 lines broad.—Alkaline clay soil of desert valleys: Mohave Desert; Inyo Co. to Lassen and Modoc Cos.; e. to N. Mex., n. to Wash.

14. **SUAÈDA** Forsk. Sea Blite

Fleshy plants of salt marshes or alkaline plains, with alternate subterete linear leaves. Flowers perfect, or with perfect, staminate and pistillate on the same plant, sessile in the axils of the leafy bracts, minutely bracteolate; calyx with 5 lobes, fleshy, inclosing the utricle and mostly carinate or crested. Stamens 5. Styles 2 or 3, short and rather thick. Seed with a dark shining crustaceous testa and a spiral embryo. (Name from the Arabic.)

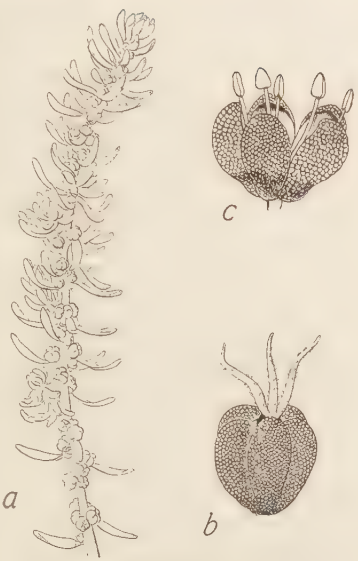
Low shrubs or bushes; calyx not appendaged; stigmas from the concave summit of a short style; lower leaves mostly with an obscure short petiole.
Branchlets rather densely crowded with leaves and flowers; calyx cleft about half way.....1. *S. californica.*
Branchlets with smaller less crowded leaves.
Mostly pubescent or woolly; calyx cleft half way.....2. *S. suffrutescens.*
Mostly glabrous and glaucous; calyx parted nearly to base.....3. *S. moquini.*
Annuals; calyx transversely appendaged; leaves sessile by a rather broad base.....4. *S. depressa.*

1. **S. califórnica** Wats. Fig. 352. Plants decumbent, 3 to 9 ft. across, the stems woody at base, succulent above and bearing ascending or erect leafy branchlets ½ to 1 ft. long; leaves spreading or somewhat recurved, broadly linear, acute, 6 lines long; flowering branches rather thick and crowded with leaves and flowers, the leaves much surpassing the flower clusters; flowers large, 2 lines broad, 1 to 3 in the axils; seed jet-black.—Sandy beaches bordering San Francisco Bay. Sept.-Oct. Var. pubéscens Jepson. Herbage woolly-pubescent.—Coast, Santa Barbara to San Diego.

2. **S. suffrutéscens** Wats. Stem woody, 1½ to 3 ft. high, bearing an irregular crown of straggling branches; herbage clothed with a fine pubescence; leaves linear, 2 to 6 (or 12) lines long, the upper little surpassing the flower clusters; calyx cleft a little over half way; clusters mostly 3 to 9-flowered; flowers small, ½ to 1 line broad.—Alkaline valleys: Colorado and Mohave deserts, n. to Inyo Co.; e. to N. Mex., s. to Mex.

3. **S. moquìni** Greene. ALKALI BLITE. Stems more or less decumbent or irregularly spreading, 2 to 3 ft. long; herbage glaucous, glabrous; flowering branches long and slender; leaves linear, 2 to 5 lines long, mostly acute; clusters several-flowered; calyx deeply 5-parted.—Alkaline soil: San Joaquin Valley; S. Cal.; e. to Col. Very like the preceding save in habit.

4. **S. depréssa** (Pursh) Wats. var. **erécta** Wats. PAHUTE WEED. Simple or branched at base, erect, strict, ½ to 1½ ft. high, glabrous, often glaucous; leaves ¾ to 1¼ in. long, acute; flowering branchlets dense, their leaves short, ovate-acuminate; calyx-lobes somewhat unequal, with a conspicuous horizontal wing on back.—Coastal S. Cal.; Modoc Co.; e. to Rocky Mts.



352. Suaeda californica Wats.; *a*, fl. branchlet x ½; *b*, pistillate fl. x 4; *c*, staminate fl. x 4.

15. SÁLSOLA L.

Bushy-branching herbs with rigid linear or subulate spinescent leaves. Flowers perfect, solitary, sessile and axillary, each subtended by 3 rigid spinescent organs consisting of a bract and 2 bractlets. Calyx 5-parted, its divisions at length horizontally winged on the back. Stamens 5. Ovary hollowed above like a shallow cup; styles 2. Seed horizontal; embryo coiled into a conic spiral; endosperm none. (Diminutive of Latin salsus, salty, most of the species of saline habitats.)

1. **S. kàli** L. var. **tenuifòlia** G. F. W. Mey. RUSSIAN THISTLE. Bushy annual 1 to 4 ft. high; leaves on the young plant linear, prickle-tipped; branches flowering from near the base; bracts ovate, shortly acuminate, prickly pointed, the bractlets similar but narrower; calyx divisions converging over mature fruit and forming a sort of beaked envelope, the wings irregular in shape and size and strongly veined.—Obnoxious weed, native of Asia: abundant in S. Cal.; San Joaquin Valley; Solano Co.; Long Valley, Lassen Co.; Alturas.

AMARANTHÀCEAE. AMARANTH FAMILY

Ours coarse herbs with simple entire leaves. Flowers small, usually greenish, inconspicuous, perfect or unisexual, in ours congested in spikes or clusters. Calyx of 3 to 5 sepals, or sometimes only 1, persistent and more or less scarious. Corolla none. Stamens 5, sometimes fewer. Ovary superior, 1-celled, with 2 or 3 stigmas. Fruit a utricle, indehiscent, bursting irregularly or circumscissile. Embryo curved.

Leaves alternate; utricle mostly dehiscent ..... 1. AMARANTHUS.
Leaves opposite; utricle indehiscent ..... 2. TIDESTROMIA.

1. AMARÁNTHUS L. AMARANTH

Annual weeds with alternate leaves and small green or sometimes purplish glabrous flowers. Flowers bracteate, disposed in axillary or terminal spikes,

or in axillary clusters, usually monoecious or polygamous, rarely dioecious, commonly with staminate and pistillate flowers in same cluster. Seed mostly black and shining. (Greek a-, not, and maraino, to fade, the spikes of certain species retaining their color in drying.)

Utricle circumscissile, the top falling away as a lid.
  Sepals mostly narrowed upward; flowers monoecious.
    Flowers in dense terminal and axillary spikes; sepals 5, mostly unequal.
      Spikes stout.....1. *A. retroflexus.*
      Spikes slender.....2. *A. hybridus.*
    Flowers in small axillary clusters of short spikes.
      Sepals of same number in staminate and pistillate flowers.
        Sepals 3; plant erect, bushy-branched; utricle very rugose.....
        3. *A. graecizans.*
        Sepals 5 or 4.
          Plant prostrate; utricle a little wrinkled.....4. *A. blitoides.*
          Plant with ascending stems; utricle smooth.....5. *A. carneus.*
      Sepals of staminate flower mostly 3, of pistillate flower mostly 1.....
      6. *A. californicus.*
  Sepals 5, mostly dilated upward.
    Flowers monoecious; pistillate sepals fimbriate.....7. *A. fimbriatus.*
    Flowers dioecious; pistillate sepals mostly retuse, mucronate.....8. *A. palmeri.*
Utricle fleshy, indehiscent; sepals 2 or 3; prostrate plant.....9. *A. deflexus.*

1. **A. retroflexus** L. Rough Pigweed. Stoutish, commonly branched from the base, with erect or ascending branches, 1 to 4 ft. high; herbage roughish pubescent; leaves rhombic to oblong-ovate, petioled, 1 to 3 in. long; flowers green, densely crowded in spikes; spikes axillary and terminal, erect or slightly spreading, 1 to 4 in. long; bracts lanceolate-subulate, scarious except the green carinate midrib, 1½ to 3 lines long; sepals 5, unequal, oblong-lanceolate, cuspidate, 1 line long or less; utricle wrinkled, surpassed by the sepals.—Very common in orchards, gardens and waste lands. Introduced from trop. Am.

2. **A. hybridus** L. Green Amaranth. Stems erect or ascending, 1 to 4 ft. high; herbage glabrous or sparingly pubescent; leaves broadly ovate to ovate-lanceolate, 1 to 4 in. long; spikes slender, bristly, panicled, especially at ends of branches; sepals about ½ as long as the subulate-lanceolate bracts, oblong, acute or acuminate; utricle surpassing the calyx, scarcely wrinkled.—Introduced from trop. Am., occurring locally through the state.

3. **A. graecizans** L. Tumble-weed. Stems freely and rigidly branching, 1 to 3 or 4 ft. high, commonly of bushy outline; herbage light or somewhat yellowish green, glabrous or nearly so; leaves oblong-spatulate or obovate, 4 to 8 lines long; flowers in clusters in short axillary spikes; bracts subulate, 1 to 1½ lines long, much longer than the sepals; sepals 3, oblong, acute or obtuse, thin, shorter than the rugose utricle.—Summer weed; extremely abundant in cultivated fields; naturalized from trop. Am. The plant becomes rigid when dead and dry, and when loosened by fall winds is carried across the fields as a tumble-weed, the seeds being thus most effectively dispersed.

4. **A. blitoides** Wats. Stems branching, prostrate or spreading and mat-like, ½ to 2 ft. long; herbage glabrous or nearly so; leaves spatulate to obovate, 4 to 6 or 10 lines long, often white-nerved on the margins and beneath, drawn down to slender petioles; flowers in axillary clusters mostly shorter than the petioles; bracts ovate-lanceolate, little longer than the sepals; sepals 5 or 4, oblong or oblong-lanceolate, acute or cuspidate, slightly shorter, or 1 or 2 equaling or slightly longer, than the utricle; stamens 3; utricle somewhat wrinkled toward the summit.—Wash. to Col. and Mex.; introduced in Cal.: Santa Monica; Niles; Suisun; Yreka. Var. crássius Jepson. Stems 1 to 1½ ft. long, these and the branchlets coarsish, whitish, ascending; leaves not at all or scarcely white-veined.—East side of the Sierra Nevada from Reno to Modoc Co.

5. **A. cárneus** Greene. Stems ascending, thickish, obscurely angled or grooved, somewhat flexuous, 1 to 1½ ft. long; leaves narrowly obovate, acute, bristly tipped, ¾ to 1 in. long, acutely drawn down to a petiole; flowers in axillary clusters of short spikes little exceeding the petioles; axes of the spikes thickish, flexuous; sepals 5, unequal, broadly oblong, acuminate

or acute, equaling or the longer ones exceeding the smooth utricle, all more or less cuspidate-tipped; style short and thick, forming a distinct apiculation to the utricle; stigmas 3.—Siskiyou Co.; ne. to Ida.

6. **A. californicus** (Moq.) Wats. Stems prostrate, 4 to 12 in. long, stoutish and rather fleshy, with numerous short branchlets; leaves obovate to oblong, mostly obtuse, prominently mucronate, the veins and margins white, 2 to 5 lines long, the petiole ½ to as long; flowers green or reddish, in many small axillary clusters; sepals in staminate flower 3 (or 2), membranous, oblong-ovate, mucronate or erosulate; stamens 3 (or 2 or 1); sepals in pistillate flower 1 (or 2 or 3); utricle smooth, bursting irregularly and releasing a red seed.—Moist soils, often in beds of dried-up pools or lakes: Palomar; San Mateo Co.; Yreka; s. Ore. to w. Nev.

7. **A. fimbriatus** (Gray) Wats. Stems several from the base, 1 to 2 ft. high, simple or sparingly branched; herbage glabrous, purplish, especially the inflorescence; leaves linear, narrowed below into a short petiole, 1 to 2 in. long; flowers in rather loose clusters; clusters scattered or mostly approximate and forming a long terminal spike; bracts ovate, acute, scarious-bordered, shorter than the calyx; sepals of staminate flowers oblong, obtuse, those of the pistillate flowers broadly fan-shaped with a narrow thickened base and fimbriate margin, 1 line long; "stamens 2 or 3"; stigmas 3.—Mohave and Colorado deserts; e. to Utah and Tex., s. to Mex.

8. **A. palmeri** Wats. Stems stout, erect, 2 to 4 ft. high, glabrous or pubescent; leaves broadly ovate, acute or acuminate, broadly cuneate at base, 1 to 4 in. long, on petioles 1 to 2 times as long; flowers dioecious, in dense elongated spikes leafy at base; bracts solitary, those of the pistillate spikes subulate, spreading, rigid, awn-tipped, narrowly scarious-margined at base, 2 to 3 times as long as the flowers; calyx ¾ to 1½ lines long, falling with the fruit, unequal, obscurely cordate at base; sepals of staminate flower oblong-ovate and acute, or oblong-lanceolate and acuminate; sepals of pistillate flower obovate, retuse or truncate, usually mucronate or setaceously apiculate; stigmas 2; utricle rugose at summit.—Colorado Desert; e. to Tex., s. to Mex.

9. **A. deflexus** L. Stems slender, prostrate, a little succulent, 1 to 1½ ft. long; leaves rhombic-ovate; flowers polygamous, in short spikes clustered in the axils, or disposed in dense terminal spikes 1 in. long or more; sepals 2 or 3, oblong, surpassing the bracts; utricle 3 to 5-ribbed, surpassing the sepals, indehiscent.—Nat. from s. Eur., chiefly in gardens and streets: Santa Rosa; Berkeley; Santa Barbara; Los Angeles; Ontario.

2. **TIDESTRÒMIA** Sta.

Annuals or woody-based perennials with opposite leaves. Flowers axillary, solitary or in small glomerules, perfect, subtended by 3 small bracts and by foliaceous involucral bracts. Sepals 5, equal, thin, pubescent. Stamens 5, arising from the margin of a short cup-shaped hypogynous disk, with 5 short teeth alternating with the filaments. Utricle subglobose, indehiscent. (Ivar Tidestrom, botanist in U. S. Bureau of Plant Industry.)

1. **T. oblóngifòlia** (Wats.) Sta. White-woolly perennial; stems widely branching, forming low broad mound-like plants 9 to 15 in. high and 1½ to 3 ft. broad; leaves roundish ovate, obtuse, 3 to 10 lines long, shortly petioled; involucral bracts united and forming definite involucres; involucres paniculately disposed, subsessile or shortly peduncled, their tubes oblong-turbinate, 1 to 1½ lines long, their lobes 3, foliaceous, round-ovate, 1 to 2 lines long; sepals ovate-lanceolate, 1 line long.—Sandy desert washes: Colorado and e. Mohave deserts; Inyo Co.; e. to Ariz. and southern Nev. (Cladothrix oblongifolia Wats.)

NYCTAGINÁCEAE. Four-o'clock Family

Ours more or less succulent herbs or low shrubs with opposite entire leaves and commonly swollen joints. Flowers perfect, regular, subtended by bracts which often form a calyx-like involucre. Bracts or involucres often colored.

Calyx plicate in the bud, tubular, colored like a corolla and very delicate, 4 or 5-lobed, the lower part of its tube circumscissile and leaving a persistent base which is closely constricted over but not attached to the superior ovary. Corolla none. Stamens in ours 3 to 5 (or 7), mostly unequal, hypogynous (or perigynous in Abronia). Ovary 1-celled, 1-ovuled; style and stigma 1. Fruit an achene, closely invested by the base of the calyx-tube, which becomes very much hardened and is often striate, ridged, or winged. Embryo mostly coiled, with mealy endosperm; cotyledons 2, or by reduction only 1 in Abronia.

Flowers without an involucre, each pedicel bearing or subtended by 1 to 3 small bracts.
- Calyx campanulate or funnelform, mostly reddish or purplish.
  - Fruit 5-angled or 5-ribbed ..... 1. BOERHAAVIA.
  - Fruit globose, smooth ..... 2. HERMIDIUM.
- Calyx salver-shaped with very much elongated tube, white ..... 3. ACLEISANTHES.

Flowers subtended by an involucre.
- Involucral bracts distinct or nearly so; fruit usually winged.
  - Bracts 5 or more, wholly distinct; fruit without glands ..... 4. ABRONIA.
  - Bracts 3, distinct nearly to base; fruit with 2 rows of glands ..... 5. WEDELIELLA.
- Involucre composed of more or less united bracts; fruit not winged.
  - Fruit 5-ribbed; involucre enlarged in fruit ..... 6. ALLIONIA.
  - Fruit mostly smooth; involucre unchanged in fruit ..... 7. MIRABILIS.

1. BOERHÀAVIA L.

Slender herbs with glandular rings about the internodes. Blades of the opposite leaves unequal. Bracts minute, 1 to 3 to each flower. Flowers small, on jointed pedicels. Calyx campanulate or funnelform, 5-lobed. Stamens 1 to 5; filaments slender, united at base. Stigma shield-shaped. Fruit club-shaped to obpyramidal, 3 to 5 (or 10)-ribbed, or -angled, or narrowly winged. (H. Boerhaave, 1668-1738, famous Dutch physician and botanist, professor at Leiden.)

Calyx campanulate; fruit 5-ribbed.
- Annual; fruit glabrous ..... 1. *B. intermedia.*
- Perennial; fruit glandular-viscid ..... 2. *B. hirsuta.*

Calyx funnelform; fruit obscurely 10-ribbed ..... 3. *B. annulata.*

1. **B. intermèdia** Jones. Low, spreading or ascending, the stems almost filiform-slender, ¾ to 1¼ ft. long; leaves elliptic to lanceolate, obtuse or acute; peduncles bearing 2 to 5 umbellate or subcapitate flowers; calyx 1 line long; fruit cuneate or short-clavate, 1 to 1½ lines long.—Sw. Colorado Desert; e. to Tex., s. to Mex.

2. **B. hirsùta** Willd. Stem branching, 2 or 3 ft. long, parts or some of the internodes and petioles sparsely hirsute-glandular; leaves round-ovate, mostly obtuse or some acutish, rounded at base, ½ to 2 in. long; flowers nearly sessile in small clusters terminating slender peduncles, the peduncles more or less divaricate in a loose panicle; calyx red, 1 line long; fruit 1 to 2 lines long, 5-ribbed.—San Jacinto Valley; Coyote Cañon; e. to Ariz., s. to Mex.

3. **B. annulàta** Cov. Perennial; stem stout, erect from an ascending base, glabrous, glaucous, 1 to 3 ft. high, the middle of each internode usually with a reddish mucilaginous ring; leaves ovate-oblong, cordate or rounded at base, obtusish at apex, thick, rigid, fleshy, entire or sometimes "lacerate," 1 to 2 in. long, hirsute; petiole nearly as long as blade; flowers 3 to 4 lines long, in small clusters terminating the branches; stamens 3, and with the style, conspicuously exserted; fruit turbinate, glabrous, obscurely 10-ribbed, 2½ lines long.—Death Valley region.

2. HERMÍDIUM Wats.

Perennial glabrous herbs with thick fleshy leaves. Flowers in head-like clusters on the ends of terminal or axillary peduncles; clusters 6 to 8-flowered, each flower subtended by a large ovate leathery bract, the short pedicel adnate to the midvein of the bract. Calyx campanulate-funnelform, white to red, slightly lobed. Stamens 5 to 7, these and the style about as long as the calyx. Fruit nearly globose, smooth, glabrous. (Diminutive of the Greek Hermes, perhaps a fancied resemblance between the pediceled flower and a little statue of that god.)

1. **H. álipes** Wats. Stems several from a woody caudex, stout, ascending, simple or slightly branched, 5 to 12 in. high; leaves round to oblong-ovate, obtuse or subacute, subcordate at base, 1 to 2 in. long, very shortly petioled; bracts occasionally slightly united.—Panamint Range; White Mts.; e. to Utah.

3. ACLEISÁNTHES Gray

Perennial herbs or low shrubs. Flowers axillary or terminal, each subtended by 1 to 3 small narrow bracts. Calyx white, with a very much elongated slender tube and spreading but very small 5-lobed limb. Stamens 2 to 5, unequal, the slender filaments united at the base. Fruit narrowly ellipsoidal, 5-angled or 5-ribbed. (Greek a-, privative, cleis, something which closes, and anthos, flower, the flower not inclosed by the involucre.)

1. **A. longifòra** Gray. YERBA DE LA RABIA. Stems slender, scabrous puberulent, 6 to 10 in. long; leaves triangular-lanceolate, acute, broadly cuneate at base, ½ to 1 in. long, shortly petioled; calyx-tube 4 to 4½ in. long, its lobes 2 or 3 lines long; stamens exserted.—Maria Mts., e. Riverside Co.; e. to Tex., s. to Mex.

4. ABRÒNIA Juss.

Herbs with viscid herbage. Leaves of the opposite pairs more or less unequal. Peduncles axillary or terminal, bearing a many-flowered head subtended by 5 to 15 distinct involucral bracts. Flowers showy. Calyx salverform. Stamens commonly 5, unequal, included in the tube and inserted upon it. Style included. Persistent base of calyx 3 to 5-winged, more or less reticulate, inclosing a cylindrical achene. (Greek abros, graceful.)

1. Plants with leafy stems.

Fruits with 2 to 5 conspicuous wings.
Fruits very large and with very thick wings; seacoast.
Flowers yellow....1. *A. latifolia.*
Flowers deep dark red....2. *A. maritima.*
Fruits smaller and with thinner wings; flowers red, pink or white.
Herbage glandular or glandular-puberulent; seacoast.
Wings mostly 5, broadened upward, truncate above or tapering to the beak.
3. *A. umbellata.*
Wings mostly 3, wider, produced above into a rounded lobe which surpasses the body....4. *A. alba.*
Herbage villous, usually glandular; mostly of the interior.
Wings usually 5, often unequal....5. *A. villosa.*
Wings only 2....6. *A. pogonantha.*
Fruits narrowly winged or wingless.
Wings 5, narrow, sometimes ridge-like....7. *A. turbinata.*
Wings or ridges 2 or none....8. *A. exalata.*

2. Plants with all the leaves basal or nearly so; high montane.

Prostrate, forming thick mats; clusters 2 or 3-flowered....9. *A. alpina.*
Erect, scapose; clusters about 15-flowered....10. *A. nana.*

1. **A. latifòlia** Esch. YELLOW SAND-VERBENA. Stems stout, 1 to 2 ft. long, prostrate, only the leaves and flowering peduncles ascending or erect; herbage very succulent, glandular-puberulent; leaves orbicular and broader than long to broadly ovate, truncate or reniform at base, ½ to 1½ in. long; peduncles usually exceeding the leaves; bracts 5, broadly ovate, acute, 2 to 3 lines long; flowers somewhat fragrant, yellow, 6 lines long; fruit broadly turbinate, 4 to 7 lines long, its 5 wings more or less unequal, broadened from the base upward, then sloping abruptly to the short beak or truncate, or the wings sometimes much reduced; taproots cylindric, fleshy, ½ to 2 in. thick, 1 to 1½ ft. long, often (when large) with rope-like branches several ft. long.—Common along the seashore from Santa Barbara Co. to Monterey, San Francisco, and Humboldt Bay; n. to Vancouver Isl. May-Nov.

2. **A. marítima** Nutt. Stems prostrate, 1 to 2 ft. long; herbage glandular-puberulent; leaves thick, round-ovate, with regular flowing outline, ½ to 1¾ in. long; flowers deep dark red; bracts thick, long oblong, acute, 4 to 5 lines long; fruit large (5 to 7 lines long, 6 to 10 lines broad), its 5 wings strongly broadened upward, often somewhat produced above the body and equaling or exceeding the short beak, or sometimes one or more much reduced.—Seashore, San Luis Obispo Co. to San Diego.

3. **A. umbellàta** Lam. COMMON SAND-VERBENA. Stems slender, prostrate, viscid, 1 to 3 ft. long; leaves nearly glabrous, roundish or ovate to narrowly oblong, the margin often somewhat sinuate, 1 to 1½ in. long; heads 10 to 15-flowered, on peduncles 2 to 6 in. long; involucral bracts narrowly lanceolate, 2 or 3 lines long; calyx rose-purple, 6 to 8 lines long; fruit 4 to 5 lines long, often as broad; wings mostly 5, rather thin but firm, widened upward and broadest above, at apex truncate or sloping to the beak, usually shorter than the beak, or the wings sometimes reduced and the fruit narrow and spindle-like.—Common along the seashore from Los Angeles Co. to San Francisco and Eureka; n. to Wash.

4. **A. álba** Eastw. Similar to A. umbellata; leaves orbicular to elliptical or oblong, often wavy-sinuate; bracts narrowly ovate, acuminate; flowers white; fruit glabrous or nearly so, its body smaller and whiter than in A. umbellata, its wings thin but firm, broader below than in that species and somewhat prolonged above the body as rounded lobes.—San Nicolas Isl. Var. PLATYPHÝLLA Jepson. Leaves mostly rather broad, wavy-sinuate; flowers pinkish or reddish; fruit wings chartaceous.—Seacoast, San Diego to San Luis Obispo Co., and perhaps n. to Monterey. Var. VARIÀBILIS Jepson. Internodes elongated; leaves few, small, irregularly rhomboidal to oblong; flowers as in preceding var.; wings membranous.—San Diego to San Luis Obispo Co.

353. Abronia villosa Wats.; *a*, fl. branch x 1; *b*, fr. x 2.

5. **A. villòsa** Wats. Fig. 353. Stems trailing, ½ to 1 ft. long; herbage glandular-villous or the blades subglabrous; leaves ovate to elliptic, a little wavy-margined, ½ to 1¼ in. long; bracts narrowly lanceolate, acuminate, 3 to 5 lines long, scarious; flowers rose-purple, 5 to 8 lines long; fruit 3 lines long and 4 or 5 lines broad, 5-winged, the thin wings obliquely widened upward and forming broad diverging lobes more or less auriculately produced beyond the body; body reticulate-honeycombed; beak slender, often prominent.—San Luis Obispo Co. to San Diego Co.; e. to Ariz. and Utah. Var. AURÌTA Jepson. Body less reticulate; flowers 8 to 13 lines long.—Colorado Desert; San Jacinto Valley. Var. PINETÒRUM Jepson n. comb. Leaves smaller; fruit pink.—San Jacinto Mts. (A. pinetorum Abrams). Does not seem to differ essentially otherwise.

6. **A. pògonántha** Heimerl. Stems trailing, 10 to 12 in. long; herbage glandular short-villous or the blades nearly glabrous; leaves ovate or broadly oblong to oblong-lanceolate, 1 to 2 in. long; bracts ovate, acute or acuminate, 3 lines long; calyx pale or lavender white, or purple, 8 lines long; fruit commonly 2-winged, rarely with a third smaller wing, round-obcordate with a somewhat squarish notch at summit, 2 to 3 lines long and as broad, the body and wings reticulate.—Mohave Desert, n. to the San Carlos Range and to Inyo Co.

7. **A. turbinàta** Torr. Annual; stems ascending or suberect, puberulent; leaves round-ovate to elliptical, glabrous, bright green, ½ to 1½ in. long; bracts lanceolate, acute; flowers whitish or pinkish, 8 or 9 lines long; fruit

2½ to 3 lines long, narrowly obpyramidal, its much wrinkled wings gradually narrowed upwards and truncate at summit.—Inyo Co.; n. to Ore., e. to N. Mex.

8. **A. exalàta.** Sta. Very similar to A. turbinata and perhaps only a mere form of it; leaves ovate to roundish, truncate at base, ½ to 1 in. long; flowers 5 lines long; fruit 2 lines long, with mostly 2 ridges or narrow wings on one side, these ridges incurved and forming a sort of half-closed concavity; beak prominent for the size of the fruit.—Kern River; Owens Lake; e. to Nev.

9. **A. alpìna** Bdg. Stems from perennial roots, shortly branched, forming dense mats, 3 to 6 in. across; herbage glandular but blades mostly glabrous; leaves orbicular to round-ovate, 2 to 3 lines long, the petioles 1 to 3 times as long; involucres 3 to 5-flowered, on peduncles 2 to 3 lines long; flowers pink or white, 5 or 6 lines long, the limb 3 to 4 lines broad; fruit 1½ to 2 lines long, narrowed to both ends, 5-angled but not winged.—High sandy meadows, 8000 to 9000 ft., s. Sierra Nevada from near Mt. Whitney to Olancha Peak.

10. **A. nàna** Wats. Peduncles 3 or 4 in. high, erect, scape-like, arising from a dense tuft of leaves crowning the shortly-branched caudex of a perennial root; herbage glandular-puberulent or the blades nearly glabrous; leaves ovate to oblong, 4 to 10 lines long, mostly long-petioled; involucre about 13 to 20-flowered; bracts ovate to oblong-lanceolate; flowers 6 lines long; fruit obcordate in outline, the wings membranous.—Desert ranges, 6000 to 9000 ft.: Mohave Desert; e. to Ariz. and Utah.

5. WÈDELIÉLLA Ckl.

Prostrate herbs, ours perennial. Leaves of the opposite pairs very unequal. Flowers reddish, rose-color or white, 3 in each involucre. Involucres solitary on axillary peduncles, deeply divided into 3 sepal-like bracts. Calyx with a short oblique tube and 4 unequal lobes. Fruit leathery, smooth and somewhat carinate on the convex side, the opposite side furnished with 2 low parallel thin ridges, each bearing a row of stipitate glands and covered by the inflexed toothed margins of the lateral wings. (Diminutive of Wedelia, Loefling's name for this genus, which is doubtless based on a personal name.)

1. **W. incarnàta** (L.) Ckl. Stems slender, 1 to 2½ ft. long; herbage pubescent; leaves ovate, acute, the veins prominent on the under side, ½ to 1⅜ in. long, shortly petioled; flowers white to rose-color, 3 to 4 lines long; fruit 2 lines long, its inflexed margin 2 or 3-toothed.—Cañons on w. border of Colorado Desert; e. to Utah and Tex., s. to Chile. Var. VILLÒSA Ckl. Stems villous pubescent.—Providence Mts. Var. NUDÀTA Ckl. Upper internodes long and upper leaves somewhat reduced.—Palm Cañon, Mt. San Jacinto; Coachella; Chuckawalla Wash; Ash Hill, Mohave Desert.

6. ALLIÒNIA Loefl. UMBRELLA-WORT

Perennial herbs. Leaves slightly fleshy. Involucres 5-lobed, in fruit enlarged and membranous or reticulate-veined, 1 to 3-flowered. Flowers red to purplish or white. Calyx campanulate or funnelform. Stamens 3 to 5, unequal; filaments united at base or nearly distinct. Fruit clavate, 5-angled or 5-ribbed. (Chas. Allioni, 1725-1804, Italian botanist.)

1. **A. pùmila** Sta. Stems erect or spreading, 4 to 7 in. high, from a thick woody root; herbage viscid pubescent or nearly glabrous; leaves ovate to broadly lanceolate, ¾ to 1½ in. long, shortly petioled; involucres one to an axil, shortly peduncled; flowers unknown; fruit with 4 or 5 low more or less tuberculate ribs, 3 lines long, pubescent.—Santa Aña River, San Bernardino Mts.; e. Mohave Desert; s. Nev. (A. brandegei Sta.)

7. MIRÁBILIS L.

Perennial herbs. Flowers 1 to several in a 5-lobed calyx-like involucre. Involucres mostly campanulate, axillary or terminal, borne on short peduncles and in clusters or solitary. Calyx campanulate to funnelform, white or red.

Stamens usually 5. Fruit narrowly ellipsoidal to globose, not angled or ribbed, or rarely so, mostly smooth, glabrous. (Latin mirabilis, wonderful.)

Flowers several in an involucre; calyx funnelform; stamens united at base.—Subgenus QUAMOCLIDION.
- Fruit 5-angled, tuberculate.....1. *M. greenei.*
- Fruit not angled, 10-striate, not tuberculate.....2. *M. froebellii.*

Flowers solitary in each involucre; calyx campanulate; stamens distinct; fruit smooth.—Subgenus HESPERONIA.
- Involucral lobes linear or lanceolate, 1 to 2 times as long as tube....3. *M. tenuiloba.*
- Involucral lobes short-ovate to short-lanceolate, ½ to as long as tube....4. *M. laevis.*

1. **M. greénei** Wats. Stems several from a perennial root, once or twice forked, 1 to 2 ft. high; herbage minutely glandular-puberulent; leaves ovate, acute, 1½ to 2½ in. long, shortly petioled; involucres 7 to 10-flowered, 1 to 1¼ in. high, campanulate, shortly lobed, the lobes broad, acute at apex; calyx greenish purple, tubular-funnelform, 1½ in. long; fruit "5-angled," longitudinally ridged, more or less tuberculate.—Tehama Co. to Siskiyou Co.

2. **M. froebéllii** (Behr) Greene. Stems stout, many from a perennial root, forking and diffusely spreading and so forming circular plants 1 to 3 ft. broad; herbage glandular-pubescent; leaves broadly ovate, 1¼ to 4 in. long, often broader than long, subcordate at base, acutish or obtuse at apex; petioles short; involucre 5 or 6-flowered, campanulate, 8 to 10 lines long, cleft nearly half way into acute lobes; calyx bright or pale purple, funnelform, 1½ to 1¾ in. long, the limb 1 to 1½ in. across; fruit light brown, marked by 10 vertical lines of a darker color, not tuberculate.—Kern Co. and Argus Mts. to San Diego Co. In desert washes single plants when in flower form masses of rose-color the size of a wagon-wheel. Var. GLABRÀTA Jepson. Herbage glabrous.—San Jacinto Mts.; San Felipe.

3. **M. tenuíloba.** Wats. Stems branching, woody at base, 1 to 1½ ft. high; herbage short pilose and glandular; leaves ovate, acute, truncate or subcordate at base, 1 to 2 in. long, sometimes broader than long, shortly petioled; involucres subcylindric, 4 to 6 lines long, cleft to the middle or below into lanceolate or linear lobes; calyx white, hairy; fruit broadly ovoid, smooth, brown.—Colorado Desert; s. to L. Cal.

4. **M. laèvis** (Benth.) Curran. WISHBONE BUSH. Stems erect or ascending, many from the base, repeatedly forked, woody below, forming a bush 1 to 1½ ft. high; herbage roughish puberulent to almost glabrous, the inflorescence glandular-pubescent; leaves ovate, mostly acute, subcordate or rounded at base, ½ to 1 in. long, shortly petioled; involucres 2 to 3 lines long, in terminal clusters or solitary in the axils, each involucre on a short peduncle; involucral lobes oblong-ovate, obtuse or acute, equaling or a little exceeding the tube; calyx rose-color or reddish, 4 to 6 lines long, narrowly campanulate, its spreading lobes deeply cleft into 2 somewhat diverging segments; fruit ellipsoidal, sometimes obscurely striate longitudinally, often lineate-mottled transversely, 1½ to 2 lines long.—Mts., Kern and Inyo Cos., s. to San Diego Co. (M. californica Gray.) Var. GLUTINÒSA Jepson n. comb. Herbage short-villous and glandular; leaves round-ovate, obtuse or acute, sometimes almost reniform; calyx white.—Colorado and Mohave deserts, n. to Inyo Co. (M. californica var. glutinosa Jepson.) Var. RETRÓRSA Jepson n. comb. Herbage bright green, minutely and retrorsely scabrous, often sparingly so, especially on the stems; calyx white.—Mohave Desert, n. to western Nev. (M. californica var. retrorsa Jepson.) Var. ÁSPERA Jepson n. comb. Herbage retrorsely pubescent or villous; leaves broadly ovate, obtuse or acute, subcordate at base, shortly petioled; calyx purplish red; fruit subglobose, brown, longitudinally 10-striate, the striae of lighter color.—Dry hills, Mohave Desert. (M. californica var. aspera Jepson.)

BATIDÀCEAE. BATIS FAMILY

Low maritime bush or woody plant with opposite entire fleshy leaves. Flowers dioecious, crowded in catkins. Catkins sessile, axillary, disposed in terminal spikes. Staminate flower with a 2-lobed calyx, 4 stamens and 4 alternating petal-like staminodia. Pistillate flower without calyx or corolla,

consisting of a 4-celled ovary with one ovule in each cell, and a sessile capitate stigma. Seed without endosperm; embryo slightly curved.

1. BÀTIS P. Br.

One genus. (Greek batis, the ancient name of some seashore plant.)

1. **B. marítima** L. Stems erect or ascending from a woody perennial base, ½ to 3 ft. high; leaves linear-oblanceolate, ½ to 1¼ in. long; staminate catkins 2 to 4 lines long, their bracts persistent; staminodia white, with a somewhat cucullate appendage; pistillate catkins 1 or 2 lines long, their bracts deciduous; ovaries coherent, in fruit forming a fleshy spikelet 4 to 6 lines long.—Seashores: San Pedro to Newport and Old Town, San Diego; L. Cal.; Hawaiian Isls.; Fla. to Brazil.

AIZOÀCEAE. Carpet-weed Family

Ours prostrate or decumbent herbs. Flowers perfect and regular, either solitary or clustered. Calyx 4 or 5-lobed or -parted, either free from or more or less adnate to the ovary. Stamens hypogynous or commonly perigynous, fewer than the sepals or more numerous. Fruit a loculicidal or circumscissile capsule or indehiscent. Plants of widely divergent aspect and flower structure.

Calyx free from the ovary; petals none; leaves opposite.
  Capsule loculicidal, 3-valved; sepals 5; ovary 3-celled.
    Stamens 3 to 5; herbage glabrous.....1. Mollugo.
    Stamens 5 to 10; herbage soft-pubescent.....2. Glinus.
  Capsule circumscissile; calyx 5-cleft.
    Stipules scarious, laciniate; ovary 1-celled; stamens 1 to 3.....3. Cypselea.
    Stipules none; ovary 2 to 5-celled; stamens numerous.....4. Sesuvium.
Calyx tube adnate to the ovary, the flattish summit of the latter free.
  Petals none; leaves alternate, plane; fruit indehiscent.....5. Tetragonia.
  Petals numerous; leaves opposite, 3-sided and very fleshy; fruit dehiscent.....
    6. Mesembryanthemum.

1. MOLLÙGO L. Carpet-weed

Low glabrous much-branched annuals with whorled leaves and obsolete stipules. Flowers axillary, on slender pedicels. Sepals 5, scarious-margined, white within, thus resembling petals when expanded, persistent. Petals none. Stamens 5, hypogynous and alternate with the sepals, or 3 and alternate with the cells of the ovary. Stigmas 3. (Ancient Latin name for some soft plant.)

1. **M. vérticillàta** L. Indian Chickweed. Stems prostrate, slender, many from the base, 3 to 7 in. long, forming patches, not fleshy; leaves 5 or 6 in a whorl, unequal, oblanceolate, or spatulate, entire, 4 to 8 lines long; flowers several at each node; sepals oblong, 1 line long; capsule ovoid, scarcely exserted from the calyx; seeds reniform, shining, nearly smooth, obviously striate, crowded in the capsule and irregularly distending its half-transparent walls, which are thus roughened.—Los Angeles; Visalia; Healdsburg; Princeton; Shasta Co.; Modoc Co.; nat. from the Old World tropics.

2. GLÌNUS L.

Annual herbs with whorled petioled leaves; very near Mollugo. Flowers pediceled in dense glomerules in the upper axils. Stamens 5 to 10 or 20. Seeds with a strophiole, the funiculus very long and slender. (Greek name of Theophrastus for a maple, application to this genus unknown.)

1. **G. lotoìdes** Loefl. Diffusely branched from the base, the stems 4 to 8 in. long, procumbent or ascending; leaves orbicular to obovate, rounded at apex or abruptly acute, 3 to 6 lines long, at base narrowed to a slender petiole; flowers 2 lines long; stamens 5; seeds blackish, granulated.—Lathrop; Chico; Lakeport; introd. from Eur. but only slightly established.

3. CYPSELÈA Turp.

Inconspicuous prostrate annual. Leaves opposite, those of each pair unequal, and with scarious laciniate stipules. Tube of the calyx short, campanulate, the lobes (in ours) 5, ovate, unequal. Petals none. Stamens 1 to 3. Ovary superior, 1-celled; style 2-cleft. Fruit a subglobose circumscissile cap-

sule. Seeds minute, smoothish, the funiculi persistent on the central placenta. (Greek kupsele, a beehive, which the capsule is thought to resemble.)

1. **C. humifùsa** Turp. Stems much branched and matted, the plants 1 to 2 in. broad; leaves oblong or elliptical, obtuse, 2 to 6 lines long, the petioles slender, nearly as long.—Immigrant from the West Indies, occurring sparingly in low lands and rarely seen: lower San Joaquin River; Aptos, Santa Cruz Co.

4. SESÙVIUM L.

Fleshy decumbent or prostrate herbs with opposite leaves and no stipules. Flowers solitary in the axils, sessile or shortly pediceled. Calyx-tube turbinate, the lobes 5, rose-pink inside, oblong, obtuse. Petals none. Stamens (in ours) numerous, inserted on the calyx. Ovary 2 to 5-celled, with as many separate styles. Capsule membranous, the upper part falling off as a lid. Seeds smooth. Embryo annular. (Latin Sesuvium, the country of the Sesuvii, a Gallic tribe mentioned by Caesar, the application to this genus unknown.)

1. **S. séssile** Pers. Lowland Purslane. Stems prostrate, freely branching, 1 to 3 ft. long; herbage finely warty; leaves broadly spatulate, ½ to 2 in. long; flowers 4 to 5 lines long; sepals ovate-lanceolate, commonly acuminate, 3 lines long; leaves and stems glabrous.—River lowlands and alkaline fields: San Joaquin Valley; s. to S. Cal.; e. to Kan., s. to Mex. and Brazil. May-Aug.

5. TETRAGÒNIA L. Sea Spinach

Ours a succulent annual with alternate plane leaves. Flowers axillary, greenish, apetalous. Calyx 4 or 5-lobed, its tube adnate to the 3 to 9-celled ovary. Stamens in ours 7 to 16, perigynous. Fruit a hard or bony nut, indehiscent, enveloped by the calyx which bears several horn-like protuberances. (Greek tetra, 4, and gonu, knee or angle, alluding to the fruit.)

1. **T. expánsa** Murr. New Zealand Spinach. Branches procumbent or prostrate; leaves rhombic-ovate, entire, 1 to 2½ in. long, abruptly contracted at base to a broad petiole, the surface covered with crystalline papillae; flowers subsessile, 1 to 3 in each axil; calyx-lobes widely spreading, yellowish within; fruit 4-horned, 4 to 6 lines long.—Native of Australasia, cult. in Cal. for use as summer greens and sparingly spontaneous on seabeaches: Alameda; San Francisco; Pacific Grove; Canada del Refugio, Santa Barbara Co.

6. MESÉMBRYÁNTHEMUM L. Fig Marigold

Ours herbs. Stems and leaves very succulent, without stipules. Flowers axillary and terminal. Calyx-tube adnate to the ovary, the lobes unequal and foliaceous. Petals linear, very numerous, inserted with the many to numerous stamens on the tube of the calyx. Ovary 5 to 12-celled, the styles as many as the cells of the ovary and distinct or nearly so. Capsule becoming baccate, dehiscing in rainy weather by stellate valves at the flattened summit. Seeds minute, numerous. (Greek mesembria, mid-day, and anthemon, blossom.)

Annual; leaves alternate; herbage covered with shining vesicles; ovary 5-celled.
Leaves linear, semiterete.....1. *M. nodiflorum.*
Leaves ovate to spatulate, flat.....2. *M. crystallinum.*
Perennial; leaves opposite, thick, dorsally carinate; herbage smooth; ovary 8 to 12-celled. 3. *M. aequilaterale.*

1. **M. nodiflòrum** L. Stems several from the base, prostrate or ascending; herbage covered with fine vesicles; leaves linear, 4 to 8 lines long, ½ to 1 line wide; flowers solitary in the axils, subsessile or shortly peduncled; petals white, minute, much shorter than the calyx-lobes.—S. Cal. coast.

2. **M. crystallìnum** L. Ice-Plant. Stems repeatedly and rather shortly forked, 1 to 2 ft. long; herbage covered with crystalline-dewy vesicles; leaves broadly ovate to broadly spatulate, ¾ to 1½ in. long, narrowed to a short amplexicaul base, the lowest 2 to 5 in. long and nearly as broad and with a subcordate petioled base; calyx campanulate, 4 to 6 lines long; petals

reddish, varying to white.—Coast from Santa Barbara Co. to San Diego; L. Cal.

3. **M. aèquilateràle** Haw. Sea Fig. Stems several ft. long, the plants forming extensive mats; leaves 3-sided, with nearly flat faces, thicker than broad, 1½ to 2 in. long; flowers terminal, subsessile or shortly peduncled, fragrant and showy (1¼ to 2 in. broad); petals bright rose-purple.—Dunes and cliffs near the sea, Marin Co. to San Diego. In cultivation at Berkeley under the student name of "Faculty Onions." Also called "Beach-Strawberry."

M. édule L. Hottentot Fig. Leaves curved, serrate on the lower angle; stamens 8; flowers yellow or purple.—Cultivated as a sand-dune binder; an escape on the Los Angeles coast; native of S. Afr.

PÒRTULACÀCEAE. Purslane Family

Ours low herbs with succulent entire leaves and regular perfect flowers. Calyx chorisepalous (synsepalous and superior in Portulaca). Sepals 2 (or in Lewisia 2 to 8), fewer than the petals. Petals commonly 5 (3 to 16), opening only in sunshine, withering quickly. Stamens 3 to 20, sometimes more numerous, opposite the petals when of the same number. Ovary 1-celled, commonly superior; styles 2 to 8, united below or distinct, stigmatic along the inside. Fruit a capsule, dehiscent from the apex by 2 or 3 valves, or circumscissile and the top falling away as a lid.

Capsule 2 to 3-valved; sepals 2, distinct and free from the ovary, persistent.
- Style 1, stigmas 2; flowers mostly in scorpioid spikes; capsule 2-valved; sepals plane, scarious or scarious-margined.....1. Calyptridium.
- Style-branches 3; sepals more or less concave.
  - Flowers in leafy racemes or in panicles; petals commonly red, showy; stamens mostly 5 or more; seed numerous; annuals.....2. Calandrinia.
  - Flowers in naked or merely bracteate racemes; petals commonly white or pinkish; seeds few (3 to 6).
    - Stems from mostly fibrous roots; stamens 5 (or 3); annuals, or perennials by rhizomes or stolons.....3. Montia.
    - Stems from thick roots or corms; stamens 5.....4. Claytonia.

Capsule circumscissile; stamens few to numerous.
- Sepals 2 to 8, distinct and free from the ovary, persistent.....5. Lewisia.
- Sepals 2, united below and partly adherent to the ovary, the free upper portion deciduous.....6. Portulaca.

1. CALYPTRÍDIUM Nutt.

Herbs with alternate or basal spatulate leaves. Flowers small (1 to 2½ lines long), in panicles or mostly in solitary or clustered scorpioid spikes. Sepals 2, scarious or scarious-margined, orbicular. Petals 2 to 4. Stamens 1, 2, or 3. Style simple; stigmas 2. Capsule membranous, 2-valved, few to many-seeded. (Greek kaluptra, a calyptra, the petals closing over each other and carried up on the capsule.)

Style very short, this and the 1, 2, or 3 stamens included; capsule 5 to 20-seeded.—Subgenus Eucalyptridium.
- Spikes not scorpioid, borne in a panicle; petals 3 (or 2); stamen 1; capsule 3 to 4 times length of fruiting calyx.....1. *C. monandrum.*
- Spikes scorpioid, sometimes very short; capsule little or not at all surpassing fruiting calyx.
  - Petals 2; stamen 1.....2. *C. roseum.*
  - Petals 4; stamens in same species 1, 2, or 3.
    - Sepals not emarginate or reniform at base; S. Cal.....3. *C. parryi*
    - Sepals round-reniform; Clear Lake region.....4. *C. quadripetalum*

Style long, filiform, this and the 3 stamens exserted; spikes borne in an umbel or capitate-congested at summit of the scape-like stems; capsule few-seeded.—Subgenus Spraguea.....5. *C. umbellatum.*

1. **C. monándrum** Nutt. Annual; stems several from the base, spreading or prostrate, 1 or 4 to 9 in. long; leaves mostly in a basal rosette, some scattered along the stem, linear-spatulate, ¾ to 2 (or 3) in. long; flowers in short spikes in a terminal panicle; panicle 1 to 6 in. long; sepals 1 line long, little accrescent; petals commonly 3; capsule linear, compressed, becoming much exserted, 3 to 4 lines long, more or less curved on dehiscence, 5 to 10-seeded.—Coastal S. Cal. (abundant); Colorado and Mohave deserts to Monterey, Kern and Inyo Cos.; e. to Ariz.

2. **C. ròseum** Wats. Annual; stems several from the base, decumbent, 1 to 3 in. long; leaves oblong-spatulate, 3 to 8 lines long, the basal ones few; flowers in very short scorpioid spikes; sepals orbicular-reniform, very shortly acute, green-herbaceous with scarious margins, 1 to 1½ lines long; petals 2, minute; stamen 1; capsule not exceeding the calyx, 6 to 12-seeded.—High mts., 9000 to 10,200 ft.: White Mts., Inyo Co.; w. Nev. to Ore. and Wyo.

3. **C. párryi** Gray. Annual; stems several from the base, prostrate, 3 to 6 in. long; leaves spatulate, 4 to 8 lines long; spikes in age secund and scorpioid, 4 to 12 lines long; fruiting sepals orbicular or oval, herbaceous but white-margined, 1 to 2 lines long, a little shorter than the oblong capsule; style one-half length of the ovary; capsule valves minutely notched at summit.—San Bernardino and San Jacinto mountains, 6500 to 9300 ft.

4. **C. quadripétalum** Wats. Annual; stems many, erect or spreading from a decumbent base, 2 to 4 (or 9) in. long; leaves basal and cauline, oblong-spatulate, 1 to 2 in. long including the tapering petiole; spikes dense, 3 to 8 lines long, terminating the leafy branches; sepals round-reniform, white-scarious and rose-tinged with greenish center, 2 to 4 lines broad, exceeding the 4 petals; capsule oblong-oval, 10 to 20-seeded, little or not at all surpassing the fruiting calyx.—Mts. around Clear Lake. June.

5. **C. umbellàtum** (Torr.) Greene. PUSSY PAWS. Annual, biennial or perennial; stems several, erect or ascending, scape-like, 3 to 15 in. high, arising from a dense rosette of leaves; basal leaves spatulate, 1 to 2 (or 4) in. long, the cauline leaves few and similar, or mostly reduced, or none: flowers imbricate-crowded in scorpioid spikes; spikes borne in a terminal umbel or whorl, 3 to 6 lines long, on peduncles ½ to 2 times as long; sepals orbicular, emarginate at base and apex, equal, wholly scarious or with a mere greenish center, dull white or often pink, in age 2 to 4 lines broad; petals 4, pink or white, obovate; stamens 3, each filament enfolded by a half-involute petal, the fourth petal embracing the style; stamens and the long style exserted; ovules 3 to 6 (or 10); capsule globose-ovate, 1 or 2-seeded; seed black, shining, microscopically tesselate.—Fine gravelly or sandy soil, common in open places in the mts., on plateaus, slopes, valley floors, or washes, 2500 to 8000 ft.: high mts. of S. Cal.; Sierra Nevada; Coast Ranges; n. to B. C., e. to Nev. and n. Rocky Mts. June-Sept. Var. CAUDICÍFERUM (Gray) Jepson. Alpine perennial, all the parts much reduced; caudex branching, the branchlets short and densely leafy, bearing one terminal scape-like stem ½ to 2 in. high; leaves 3 to 6 (or 10) lines long; flowers glomerate-capitate.—Sierra Nevada, 8000 to 13,000 ft.; n. to Wash., e. to Wyo.

2. CALANDRÍNIA H.B.K.

Ours low fleshy annuals with alternate entire leaves and ephemeral red or rose-colored flowers, rarely varying to white. Flowers in a leafy raceme or in a panicle. Sepals 2, persistent. Petals 5, rarely more or less (3 to 7). Stamens 5 to 14, rarely 3, seldom of the same number as the petals. Style-branches 3. Capsule 3-valved from the apex. Seeds numerous, black and often shining. (J. L. Calandrini, Swiss botanist.)

Flowers in a raceme or mostly so; seeds with a strophiole.
- Herbage green; calyx green; racemes erect; pedicels clavate-thickened and a little angled; seed black and shining, apparently smooth but microscopically papillate, the strophiole white, minute.
  - Capsule enveloped by the fruiting calyx, the latter as long or nearly; branches mostly ascending or erect; common.....1. *C. caulescens.*
  - Capsule nearly twice as long as the fruiting calyx; branches mostly trailing; rare.....2. *C. breweri.*
- Herbage glaucous; calyx and bracts black-veined or -mottled; racemes a little drooping at apex, the pedicels filiform; seed roughish, with a large strophiole; rare..3. *C. maritima.*

Flowers in an umbellate panicle; seeds without a strophiole; Colorado Desert.4. *C. ambigua.*

1. **C. cauléscens** H.B.K. Stems spreading or ascending, 6 to 12 in. high; leaves narrowly oblanceolate to linear, acute, 1 to 2 in. long, somewhat succulent; flowers short-pediceled; pedicels erect; sepals ovate, apiculate or short-acuminate, glabrous or somewhat hispidulous on the margins or mid-

354. Calandrinia caulescens var. menziesii Gray; *a*, fl. branch x ⅔; *b*, sect. pistil x 5.

ribs; petals 5, red, obovate, obtuse, 2 to 4 lines long; stamens 3 to 6, sometimes more; capsule ovate, short-pointed, enveloped by the sepals which are nearly or quite as long.—Humboldt Co.; se. Cal.; Ariz. and s. to Bolivia. Var. MENZIÈSII Gray. Red Maids. Fig. 354. Stems 1 to several or many from the base, simple or sparingly branched, diffuse, or erect and simple, ½ to 2 ft. long; pedicels long (5 to 11 lines long) or sometimes short (3 to 5 lines long); petals orbicular-obovate, retuse at apex, crimson or rose-red, 3 to 5 lines long; stamens 7 to 14, commonly 10 to 12, rarely fewer than 7.—Orchards and vineyards, often very abundant in wet years; also in fields and on hilltops. Mar.-Apr. Flowers opening of afternoons. Called "Kisses" in Solano Co.

2. **C. bréweri** Wats. Stems lax, trailing or sometimes ascending, 1 to 2 ft. long; leaves spatulate or oblong-spatulate, 1 to 2½ in. long; flowers sparse; pedicels longer than in no. 1, typically deflexed in fruit; capsule narrower and longer (5 to 6 lines long) than in no. 1, at length twice or nearly twice as long as the calyx; sepals with a grooved edge, the lower margin of the groove scarious.—Coulterville; Mt. Tamalpais; Santa Barbara Co.; San Bernardino Mts.; Santa Cruz Isl.; s. to L. Cal. The known localities few and scattered. June.

3. **C. maritima** Nutt. Stems several from the base, spreading or ascending, 3 to 8 in. long; herbage very glaucous; leaves mostly basal or on lower part of stem, spatulate-obovate, narrowed to a petiole-like base, 1 to 2½ in. long; flowers long-pediceled in a terminal raceme or loose panicle, ¼ to 1¼ in. long; flowers red; sepals round-ovate, dark-veined, mucronate or abruptly short-acute, slightly surpassed by the ovate capsule.—S. Cal. coast from Santa Monica to San Diego; L. Cal.

4. **C. ambigua** (Wats.) Howell. Stems several from the base, erect or a little spreading, 2 to 7 in. high; stems and leaves very succulent; leaves linear-spatulate, 1 to 1½ in. long; flowers pediceled in rather compact umbellate panicles; pedicels 1 to 3 lines long; sepals ovate with shortly acute spreading tips and white-scarious margins, 1 to 2½ lines long, equaling or exceeding the 5 obovate white petals; stamens 5 (or 6 to 8); seeds many.—Colorado Desert. Apr.-May.

3. MÓNTIA L. Indian Lettuce

Moderately succulent low herbs, very glabrous and often glaucous. Stems usually clustered. Leaves alternate, opposite, or basal. Flowers white or pinkish, commonly nodding in the bud, usually reopening the second or third day, borne in racemes or sometimes umbellate clusters. Pedicels commonly spreading or recurved in fruit. Sepals 2, persistent. Petals 5, equal or somewhat unequal, distinct, or more or less connate at base. Stamens 5 or 3. Styles-branches 3. Ovules commonly 3 (or to 6). Capsule 3-valved from the apex, 1 to 3 (or 6)-seeded. (Giuseppe Monti, Italian botanist, died 1760.)

A. Petals united at base into a tube, not notched at apex.

Stamens 3; petals unequal; leaves opposite.....1. *M. fontana.*

B. Petals distinct or a little united, commonly notched at apex.

1. Leaves alternate; petals equal or unequal.

Stamens 3; annuals; petals unequal.
Petals minute; upper leaves scarious-dilated at base.....2. *M. howellii.*

Petals 2 lines long; leaves less scarious-dilated at base or scarcely at all so.....
3. *M. linearis*

Stamens 5; petals equal.
Stems diffuse, dichotomous; annual.....4. *M. diffusa.*
Flowering stems simple and scape-like; perennial by stolons or bulblets.....
5. *M. parvifolia.*

2. Leaves basal or opposite; petals equal; stamens 5.

Stems bearing several pairs of opposite leaves; racemes axillary or terminal; perennial by bulblets.....6. *M. chamissoi.*
Stems bearing one pair of leaves, these opposite; racemes terminal.
Cauline pair of leaves more or less united; annuals.
Cauline pair of leaves united into a roundish or angular disk; petals commonly white and usually little surpassing the sepals; rather coarse annual...
7. *M. perfoliata.*
Cauline pair of leaves not forming a disk, partially joined on one side.
Stems slender; petals commonly pink, 3 times as long as sepals.....
8. *M. gypsophiloides.*
Caespitose dwarf; petals white, little exceeding sepals....9. *M. spathulata.*
Cauline pair of leaves quite distinct.
Racemes bracteate in nos. 12 and 13, bractless in 10 and 11.
Annuals; pedicels 1 to 3 lines long.
Plant somewhat diffuse; leaves narrowly linear.....10. *M. exigua.*
Plant a succulent ball; leaves obovate or spatulate, nearly sessile.....
11. *M. saxosa.*
Perennials; pedicels ½ to 2 in. long.
Stem from a thick crown or short rootstock; coast.....12. *M. sibirica.*
Stem from a small tuberous rootstock or cormlet; high s. Sierra Nevada.....13. *M. heterophylla.*
Racemes bractless; perennial plants with horizontal rootstock.
Flowers in a loose raceme; racemes much exceeding the basal leaves; pedicels ½ to 1¼ in. long; Humboldt and Siskiyou Cos.....
14. *M. asarifolia*
Flowers in an umbellate fascicle; fascicles mostly shorter than the basal leaves; pedicels 5 to 7 lines long.....15. *M. nevadensis.*

1. **M. fontàna** L. WATER CHICKWEED. Annual, or sub-perennial by rooting at the nodes; stems slender, 2 to 6 in. long, ascending or procumbent; leaves opposite, narrowly oblanceolate to spatulate-obovate or oblong, slightly connate at base, 2 to 10 lines long; racemes loose, 3 to 9-flowered; sepals ½ to 1 line long; petals minute, white, unequal, united at base, and exceeding little the sepals; seeds minute, roughened.—In water on margins of small surface streams or in muddy places; occasional throughout Cal.; of world-wide distribution. Mar.-May.

2. **M. howéllii** Wats. Annual; stems simple or branching, diffuse or procumbent, ½ to 2 in. long; leaves alternate, elongated linear-spatulate, 4 to 10 lines long; racemes axillary, umbellately 2 or 3-flowered, shorter than the leaves; leaves opposite the racemes with a rather broad scarious-dilated clasping base, the racemes subtended by an ovate or short scale-like scarious bract; petals 3 or 4, unequal, minute, sometimes absent; stamens 3; seeds shining, microscopically foveolate-lineate.—Very wet soil, coast region: Humboldt Co.; n. to Wash.

3. **M. lineàris** (Dougl.) Greene. Annual, nearly simple or very much branched, erect, 1 to 6 in. high; leaves alternate, narrowly and elongated linear (1 to 2½ in. long and ½ to 1 line wide), sessile by a clasping base; racemes terminal, commonly secund, about 4 to 8-flowered; pedicels 2 to 5 lines long; sepals broad and rounded or almost truncate, white-margined, straw-color in age; petals white, unequal, narrowly obovate, narrowed at base or clawed, slightly united on one side and not on the other side, 2 to 2½ lines long, slightly exceeding the sepals; stamens 3, inserted on the very base of the smaller petals; seeds lenticular, nearly or quite 1 line broad, smooth and shining, finely reticulated under a lens.—Wet banks: central Sierra Nevada, 3000 to 4500 ft., from Mariposa Co. n. to Modoc Co.; Coast Ranges, 200 to 3000 ft., from Contra Costa Co. to Siskiyou Co.; e. to Nev.; n. to B. C. and Mont.

4. **M. diffùsa** (Nutt.) Greene. Annual, diffusely branched from the base 2 to 6 in. high; cauline leaves alternate, deltoid-ovate to ovate or the upper narrowly ovate, acute, ½ to 1 in. long, the petiole nearly as long or longer; racemes 2, 3, or 4 on a branch, opposite the upper leaves or terminal, 1 to 1½ in. long, each 4 to 7-flowered; petals emarginate, white or pink, equal,

2 lines long, slightly exceeding the sepals; pedicels deflexed or divergently spreading in fruit; seeds black, ½ line long, lineated, the lineations composed of narrow transverse plates.—Under pines in the coast region: Marin Co. to Humboldt Co.; n. to Wash. Rare.

5. **M. parvifòlia** (Moq.) Greene. Flowering stems erect or slightly spreading, whip-like or filiform and somewhat scape-like, 5 to 9 or 12 in. high, arising from the lower axils of Sedum-like rosettes of leaves borne on short caudex-like stems; these caudices also produce filiform surface runners; leaves of the rosettes ovate to oblanceolate, acute, 3 to 7 (or 10) lines long, passing into petioles as long or nearly; leaves of the flowering stems reduced above, small and bract-like (2 to 4 lines long), and bearing in their axils fleshy bulblets which fall away readily, the plant perennial by these; flowers umbellately racemose; racemes 2 to 7-flowered; sepals roundish, 1 line long, the petals equal, white or pink, retuse, 3 to 5 lines long; capsule mostly 1-seeded; seed rather dull, with minute pits.—Mossy surface of rocks and moist banks: Coast Ranges from Monterey Co. to Humboldt and Siskiyou Cos.; Sierra Nevada from Mariposa Co. n. to Modoc Co.; n. to Alas., e. to Mont.

6. **M. chamíssoi** (Ledeb.) Dur. & Jac. TOAD-LILY. Stems decumbent or ascending, 2 to 6 in. or 1 ft. long, leafy to the top, rooting at the lower nodes; perennial by means of little tuber-like bulblets produced at the end of slender runners; leaves opposite, oblanceolate to oblong-obovate, obtuse or acute at apex, tapering into a petiole at base, ½ to 1 (or 2) in. long; racemes axillary or terminal, 2 to 8-flowered, rarely 1-flowered, bractless except 1 or 2 small bracts at base; sepals orbicular, 1 line long, the petals white or pink, elliptic, rounded at apex and entire, or sometimes retuse, 3 to 4 lines long; capsule small; seeds muriculate-roughened.—Wet or swampy meadows or moist stream borders, 4000 to 9000 ft.: San Bernardino and San Jacinto mountains; Mt. Pinos; Sierra Nevada from Tulare Co. n. to Modoc Co.; Snow Mt., Lake Co.; n. to Alas. In the White Mts. we noted that sheep do not touch it.

7. **M. perfoliàta** (Donn) Howell. MINER'S LETTUCE. Fig. 355. Annual; stems several, erect or diffuse, 4 to 10 (or 16) in. high; basal leaves rhomboidal or deltoid to ovate or lanceolate or the earliest narrowly linear, ½ to 2 in. long, long-petioled; cauline pair completely united into a round and entire or angulately 2-lobed disk ½ to 2 (or 4) in. broad; racemes more or less interrupted (the flowers in 2s or 3s or fascicles), variable in length, sessile or on peduncles ¼ to 1½ in. long, or the flowers glomerate on the disk in a sessile cluster; pedicels 1 to 5 lines long, rarely ¾ in.; sepals roundish, 1 to 2 lines long; petals white, 1¼ to 1½ times length of sepals.—Mostly in the shade of oaks and other trees: common throughout Cal.; n. to B. C., e. to Ariz., s. to Sonora and L. Cal. Var. PARVIFLÒRA Jepson. Same as the species in habit, but more slender; basal leaves filiform-linear or linear-spatulate; calyx 1 line long; petals white or rose-color.—Damp shady places: general range of the species. Var. NUBÍGENA Jepson. Compact or caespitose plant with glaucescent herbage and numer-

355. Montia perfoliata Howell; *a*, habit x ⅓; *b*, *c*, fl., two different views x 3; *d*, dehiscing capsule set in calyx x 3.

356. Montia gypsophiloides Howell; habit x ½.

ous stems; leaves linear or a few spatulate at apex; racemes dense; petals white or pinkish, 3 lines long. —Mountain peaks about San Francisco Bay: Mt. Tamalpais; Mt. Diablo; Mt. Hamilton. Var. DEPRÉSSA (Gray) Jepson. Small and depressed, 1 to 4 or 5 in. high, the plant often livid red; basal leaves rhomboidal or broadly ovate, 2 to 6 lines broad, often broader than long, petioled; cauline disk split down one side or its leaves only partly united, subtending sessile glomerules or subumbellate clusters of flowers; petals twice as long as calyx. —Commonly in pine woods: Humboldt, Siskiyou and Modoc Cos.; n. to B. C.

8. **M. gypsóphiloides** (F. & M.) Howell. Fig. 356. Stems slender, erect or ascending, 2 to 9 in. high; herbage very pale and glaucous; basal leaves linear or filiform, the flowering stems 2 to several times as long; cauline pair ovate to linear-lanceolate, partially united on one side; raceme slender, elongated (half the height of the plant or more), the filiform pedicels becoming 2 to 8 lines long, spreading and often a little geniculate at the middle; flowers for their size showy and most delicately beautiful; petals pink, cuneate-obovate, retuse, 3 to 3½ lines long, about 3 times as long as the sepals.—Open summits, northward slopes or in moist thickets: Mt. Hamilton Range to Sonoma Co. Mar.-Apr.

9. **M. spathulàta** (Dougl.) Howell. Caespitose, 1 to 6 in. high, the herbage glaucous and very fleshy; leaves narrowly or elongated linear or lanceolate, nearly as long as the flowering stems; cauline leaves linear or lanceolate, nearly distinct or somewhat connate upon one (rarely on both) sides, 4 to 10 lines long, nearly equaling to ½ as long as the raceme; sepals rather less than 1 line long; petals somewhat quadrangular, retuse or rounded at apex, short-clawed, white or light pink, 2 to 3 lines long.—Common on open gravelly or rocky hill tops (often in vineyards and other cultivated areas): Coast Ranges mostly near the coast; Sierra foothills in Fresno Co.; s. to coastal S. Cal.; n. to B. C. Feb.-Mar.

10. **M. exígua** (T. & G.) Jepson. Similar to M. spathulata but looser and larger (2 to 6 in. high) and less glaucous; basal leaves about equaling the stems, elongated linear, or slightly spatulate, ½ to 1 line broad; leaves of the cauline pair linear, ½ to 1½ in. long, distinct, or slightly connate on one side, usually much exceeding the raceme; petals white, 2 lines long, twice length of sepals.—Throughout Cal., but mostly towards the interior, the known stations few: San Diego; Santa Rosa Peak; Yosemite; Mt. Diablo; Howell Mt.; Yreka; n. to B. C., s. to L. Cal. It occurs at higher elevations than M. spathulata, which is chiefly of low hills near the coast. Var. VÍRIDIS (Dav.) Jepson. Herbage green; cauline leaves lanceolate, nearly distinct.—Mt. San Antonio; Mt. San Jacinto.

11. **M. saxòsa** Bdg. Stems numerous, caespitose, forming a dense succulent ball 1 to 2 in. in diameter; basal leaves obovate or spatulate, rounded at apex, 3 to 6 lines long, nearly sessile; cauline leaves a single pair, ovate, obtuse, not connate, 2 to 3 lines long; racemes umbellate, few-flowered, the pedicels equaling or exceeding the short scape-like stems; sepals roundish, 2 lines long, the roseate petals twice as long; capsules 1½ to 2 lines long; seeds foveolate-striate.—Yollo Bolly Range from North Yollo Bolly s. to Snow Mt., about 7000 ft.

12. **M. sibírica** (L.) Howell. Stems erect, 9 to 18 in. high; root fibrous and annual with a thick crown, or the crown persistent as a short rootstock; basal leaves ovate or obovate to suborbicular, acuminate or acute, rarely obtuse, 1 to 2 in. long, on petioles 3 to 5 in. long; cauline pair similar, distinct, sessile or short-petioled; raceme very lax, 3 to 7 in. long, bracteate, the flowers on long (1 to 2½ in.) pedicels; sepals orbicular to ovate, obtuse; petals white with pink veins or pink with rose-purple lines, coarsely notched, 3 to 5 lines long, narrowed at base into a distinct claw.—Swampy places along the coast: Marin Co. to Humboldt Co.; n. to Alas. Feb.-June.

13. **M. héterophýlla** Jepson. Stems 5 to 11 in. high, rising from tuberous rootstocks or cormlets, these sending out slender stolons which produce terminal cormlets, the secondary cormlets promptly producing leaves and flowers; basal leaves narrowly ovate to oblanceolate, acute, ½ to 2 in. long, on long slender petioles; cauline pair similar, subsessile; raceme 5 to 11-flowered; pedicels becoming ¾ to 1 in. long; sepals round-ovate, obtuse or subcordate at base, 2 lines long; petals white, pink-veined, notched, twice as long as the sepals.—Sierra Nevada from Fresno Co. to Tulare Co., 5700 to 7000 ft.; Ore. to Alas. The tubers or fleshy rootstocks each produce only 1 or 2 stems and leaves, whereas in M. sibirica the numerous leaves and stems form by their bases a thick crown on the slender or fibrous taproots. Rare with us.

14. **M. ásarifòlia** (Bong.) Howell. Stems erect, naked save for one cauline pair of leaves, 7 to 12 in. high, arising from a slender horizontal rootstock; basal leaves round-ovate, obtuse to acutish, ¾ to 1¾ in. long, often broader than long, on petioles 3 to 6 in. long; cauline pair similar, sessile, obtuse or often more acute; raceme loosely 3 to 8-flowered, the pedicels ½ to 1¼ in. long; sepals orbicular, truncatish, 1½ to 2 lines long; petals white, merely retuse, 3 to 5 lines long.—High montane, 6000 to 7000 ft.: n. Humboldt Co. to w. Siskiyou Co.; n. to Alas., e. to northern Rocky Mts.

15. **M. nevadénsis** (Wats.) Jepson. Basal leaves and scapes in a tuft 1 to 2 in. high on the end of a very slender rather deep-seated rootstock; leaves rhomboidal-ovate, obtuse, 6 to 11 lines long, the petioles as long or twice as long; cauline pair ovate, acute, sessile, 3 to 4 lines long; scapes shorter than the leaves, bearing an umbellate fascicle of 5 or 6 flowers, the scapes and pedicels angled or narrowly wing-ridged; fascicle of flowers consisting of 2 to 6 peduncles, the peduncles 5 to 7 lines long, 1-flowered or racemosely 2 or 3-flowered; sepals broadly ovate, shortly acute, reddish, 1½ to 2 lines long; petals narrowly obovate or spatulate, obtuse, drawn down to a narrow claw, 4 lines long; capsule equaling or slightly longer than the sepals; seeds 4 to 6.—Subalpine, 10,000 ft.: Mt. Leavitt (A. L. Grant 420). (Probably Claytonia nevadensis Wats.; M. californica Jepson ms.)

4. **CLAYTÒNIA** Gron.

Low glabrous perennial herbs, the stems and basal leaves from globose deep-seated corms. Stems scape-like, bearing at summit a pair of opposite leaves and between them a several-flowered loose or umbellate raceme. Flowers opening for more than one day. Sepals 2. Petals 5, distinct and equal. Stamens 5. Ovules about 6. Style-branches 3. Capsule 3-valved, 3 to 6-seeded. (Dr. John Clayton, American botanist, of the colony of Virginia, who furnished Gronovius the materials for the Flora Virginica; died 1773.)

1. **C. lanceolàta** Pursh. Stems 1 to 24 from a corm, erect, 2 to 4 in. high; corm globose, about ½ in. in diameter; basal leaves few or rare, narrow, long-petioled; cauline leaves narrowly to oblong-lanceolate, sessile, 1 to 2 in. long; racemes 1, or sometimes 2 or 3, sessile or short-peduncled, 5 to 17-flowered, the pedicels bractless except the lowest; petals pink with darker veins, or nearly white, often with a yellow dot at base, emarginate or obtuse, 3 to 4 lines long; pedicels recurved in fruit.—Montane, 4500 to 7000 ft., San Antonio Mts. (Devils Backbone, F. W. Peirson); n. Sierra Nevada from Nevada Co. to Modoc Co., thence w. to Humboldt Co.; n. to B. C., e. to Utah.

5. **LEWÍSIA** Pursh

Fleshy perennials with very thick farinaceous roots bearing basal rosulate clusters of leaves and 1 to many-flowered scapes. Flowers often large and handsome. Sepals 2 to 8, herbaceous, persistent. Petals 5 to 16, varying from white to red. Stamens 5 to numerous. Styles 3 to 8, united at base, the free portion filiform, stigmatic the whole length. Capsule circumscissile near the base, the upper deciduous part more or less valvate-cleft from the base. Seeds several to many. (Capt. Lewis of the Lewis & Clark expedition across the continent, 1806-7, who collected the type species.)

Sepals 2; flowers medium; scapes commonly bearing a cyme or panicle.—Subgenus OREOBROMA.
- Stems from a small globose corm; leaves 2 or 3 below the inflorescence. 1. *L. triphylla.*
- Stems scape-like, leafless.
  - Scapes 1 to 4-flowered, with a pair of small bract-like leaves; root thick, fusiform to globose.
    - Leaves exceeding scapes; scapes 1 to 3-flowered.
      - Bracts ovate, borne above the middle of scapes; sepals ovate, obtuse, glandular-denticulate. 2. *L. pygmaea.*
      - Bracts linear, borne at surface of ground; sepals ovate, acute, entire, not glandular. 3. *L. nevadensis.*
    - Leaves shorter than the 2 to 4-flowered scapes; bracts and sepals denticulate, not glandular. 4. *L. oppositifolia.*
  - Scapes bearing a panicle of numerous flowers; leaves in a tuft on the caudex crowning a thick fleshy root; bracts and sepals ciliate-glandular.
    - Flowers 5 to 7 lines long; leaves narrowly linear. 5. *L. leana.*
    - Flowers 2½ to 3 lines long; leaves spatulate-obovate. 6. *L. cotyledon.*

Sepals and sepal-like bracts 4 to 8; flowers large; scapes 1-flowered.—Subgenus EULEWISIA.
- Stamens 10 to 15; sepals 2, decussately and closely subtended by 2 bracts which resemble them; scape said to be "jointed" under the sepals.
  - Sepals glandular-denticulate; Sierra Nevada. 7. *L. kelloggii.*
  - Sepals not glandular-denticulate; S. Cal. mts. 8. *L. brachycalyx.*
- Stamens over 15; scapes jointed near the middle or below; sepals not glandular-denticulate.
  - Sepals 4 (to 6); petals 8 to 11; stamens 16 to 26. 9. *L. yosemitana.*
  - Sepals 6 to 8; petals 13 to 15; stamens about 40 to 47. 10. *L. rediviva.*

1. **L. triphýlla** (Wats.) Rob. Fig. 357. Scape half underground, arising from a globose tuber about the size of a pea, 1 to 2 in. high and bearing a simple or compound umbellate raceme subtended by 3 or 2 narrowly linear leaves; umbel 3 to 14 (or 27)-flowered, or the flowers only 2 or 1; petals white, 5 to 7 or 10, subequal or unequal, 1¾ to 2 lines long; stamens 4 or 5; styles 5 (4 or 3).—Moist slopes or swales, in granite sand or fine gravel, 6000 to 9600 ft.: Sierra Nevada; North Coast Ranges; n. to Wash. and Ida.

357. Lewisia triphylla Rob.; habit x 1.

2. **L. pygmaèa** (Gray) Rob. Scapes several to many, 1 to 2 in. high, these and the leaves from a fleshy root; root elongated-fusiform, ¼ to 1 in. thick; leaves linear, slightly exceeding the flowers; scapes one-flowered with a pair of ovate bracts above the middle, or umbellately 2-flowered and the pedicels subtended by the bracts; sepals ovate, obtuse, glandular-denticulate; petals white, 6 to 9, subequal or unequal, often notched on one side or at apex, 3 lines long; stamens 5 to 8; styles 3 to 5; scapes soon retrocurved.—High montane, 8000 to 12,200 ft.: Sierra Nevada from Tulare Co. to Nevada Co.; White Mts., n. to Wash.; e. to the Rocky Mts.

3. **L. nevadénsis** (Gray) Rob. Fig. 358. Scapes several to many, ½ to 4 in. high, naked save for a pair of bracts near the middle—that is, near the surface of the ground; scapes and leaves arising from a fleshy carrot-shaped or

358. Lewisia nevadensis Rob.; habit x ½.

sometimes globose root; bracts linear, opposite, often a little connate by their scarious bases; leaves narrowly linear or slightly broadened upward, 1 to 2½ in. long, 1 to 2 lines broad, exceeding the scapes; flowers white, solitary and terminal on the stems; sepals ovate, acute; petals 6 to 8 (rarely 5), 6 to 7 lines long; stamens 6 to 11; styles 5 (3, 4 or 6); scapes retrocurving in fruit.—Granite sand, 7000 to 11,000 ft.; San Bernardino Mts.; Mt. Pinos; Sierra Nevada from Tulare Co. n. to Modoc Co.; n. to Wash., e. to Utah. June.

4. **L. oppósitifòlia** (Wats.) Rob. Scapes 1 to 3, erect or ascending, 6 to 8 in. high, these and the leaves from a fleshy-fusiform root, or 1 or 2 pairs of leaves on the lower part of the scape; leaves linear-oblanceolate or linear, 1 to 3 in. long; scapes naked or with 1 or 2 lanceolate bracts, bearing 2 to 4 umbellately disposed flowers on long (½ to 1½ in.) pedicels; sepals 2 to 3 lines long, roundish, denticulate at the truncate or obtuse apex but glandless; petals white or pink, 6 to 7 lines long; stamens about 12; styles 3. —Del Norte Co., Cal., to Josephine Co., Ore.

5. **L. leàna** (Porter) Rob. Scapes few, 5 to 9 in. high, rising from a thick fleshy caudex, bearing a panicle of numerous flowers and a few scattered small bracts; leaves in a dense tuft crowning the caudex, narrowly linear, acute, more or less terete, 1 to 2½ in. long and 1 to 2½ lines vide; sepals ovate or roundish, 1 line long, fimbriate with reddish gland-tipped teeth; petals 5 to 7, red, 2½ to 3 lines long; stamens 5 (or 4); styles 2; scapes disarticulating from the caudex soon after flowering.—High montane, 6000 to 9000 ft.: s. Sierra Nevada (Fresno and Mariposa Cos.); Siskiyou and Salmon mountains; n. to Ore.

6. **L. cotylèdon** (Wats.) Rob. Fig. 359. Scapes several from the leafy crown of a thick caudex, 4 to 10 in. high, bearing at summit a panicle and below the panicle two pairs of bracts; bracts ovate, acute; leaves in a dense rosulate tuft, spatulate-obovate or -orbicular, 1½ to 3 in. long; sepals roundish, very obtuse, glandular-denticulate, 2 to 3 lines long; petals 7 to 10, obovate or oblanceolate, white, strongly pink-veined along the middle, 5 to 7 lines long; stamens 6 to 9; petals 8 or 9; filaments dilated below and connate into a sheath surrounding the ovary; styles 3.—Montane, w. Siskiyou Co. and n. Trinity Co. A most attractive species. July.

359. Lewisia cotyledon R. b.; *a*, habit x ¼; *b*, fl. x ½.

7. **L. kellóggii** K. Bdg. Flowers and leaves densely crowded on the crown of a thick fleshy taproot; scapes very short, 3 to 7 lines long, jointed at the base, these and the petioles with loose transversely wrinkled whitish epidermis; leaves spatulate or obovate, obtuse, mostly

notched at apex, 3 to 5 lines long, drawn down to a petiole as long or twice as long; sepals 4, oblong-lanceolate, acute, minutely glandular-toothed, 3 to 4 lines long; petals 5 to 9, white, 2 to 3 times as long as the sepals; stamens 12 to 15; styles 5 or 4; capsule thin-walled, separating in a circumscissile manner from the receptacle at base, then splitting upwards into 4 or 5 valves.—Northern Sierra Nevada from Placer Co. to Plumas Co., 4500 to 6000 ft.

8. **L. brachycàlyx** Engelm. Scapes rather short, rising from a thickened caudex, surpassed by the moderately fleshy leaves; leaves in a spreading rosette, linear-spatulate or -oblanceolate, 1 to 4 in. long; bracts 2; sepals 2, ovate, entire, 3 to 4 lines long; petals 5 to 9, white, ½ to 1 in. long; stamens 9 to 15; styles 5 to 7.—Wet meadows, 5000 to 6700 ft.: San Bernardino Mts.; Cuyamaca Mts.; e. to Utah, Ariz. and N. Mex.

9. **L. yosémitàna** Jepson n. sp. Leaves and flowers densely crowded on the crown of a thick fleshy taproot, the flowers on very short scapes jointed at or near the base; leaves spatulate, obtuse narrowed to a petiolar base, ½ to 1 in. long; corolla white, 10 to 11 lines broad; sepals 4 to 6, oblong, ¼ to ⅓ as long as the corolla; petals 7 to 11; stamens 16 to 26; styles 5.—Summits of domes about Yosemite Valley. The plants barely push up through the granite sand; then the flowers open out on the surface of the sand, the cluster forming a rosette, which is very beautiful. The flowers do not disjoint from the plant on drying. (El Capitan, Jepson 4357, type; perhaps the same as L. rediviva var. yosemitana K. Bdg.)

10. **L. rediviva** Pursh. Bitter Root. Scapes from a thick caudex crowning a stout root, ¾ to 2 in. high, jointed near the middle and bearing an involucral whorl of 5 or 7 scarious subulate bracts; leaves linear, thick, 1 in. long; sepals 6 to 8; petals 13 to 15, pink, bright rose or white, ¾ to 1 in. long, spreading rotately; stamens 40 to 47; filaments united at base; styles 6 to 8.—Higher peaks of the hills or mts.: San Bernardino and San Gabriel mountains; Coast Ranges from Mt. Pinos to Mt. Diablo and Lake Co.; Modoc Co.; n. to B. C., e. to Rocky Mts. Inflorescence disjointing readily at the middle of the scape on drying. Apr.

6. PORTULÀCA L.

Fleshy herbs, ours annuals, with alternate leaves and yellow flowers. Calyx 2-cleft, the tube adnate to the ovary below. Petals 5 (rarely 6), inserted with the stamens on the calyx. Stamens 7 to 20. Style mostly 3 to 8-parted. Capsule globose, opening transversely, the upper part coming off like a lid. Seeds many. (Old Latin name.)

1. **P. oleràcea** L. Common Purslane. Stems 4 to 8 in. long; herbage glabrous; leaves cuneate or obovate; flowers sessile, opening only in sunshine; petals notched or 2-lobed.—Frequent in low lands throughout the state; introduced from trop. Am. June-Oct.

CARYÓPHYLLÀCEAE. Pink Family

Herbs of inert properties, with commonly swollen nodes, simple and entire leaves always opposite, and regular perfect flowers. Calyx persistent. Corolla white, red or pink. Sepals and petals 5 (or 4), the stamens as many and alternate with the petals, or twice as many, rarely fewer. Ovary superior, 1-celled (imperfectly 3-celled in some Silenae), with 1 to 5 styles and 1 to many ovules on a free central placenta. Fruit a few to many-seeded 1-celled capsule dehiscent at the summit by short valves or teeth (these as many or twice as many as the carpels), or 1-seeded and indehiscent, thus becoming an achene or utricle. Embryo commonly curved around the periphery of the seed, the endosperm occupying the center.

A. Sepals distinct or united only at base.

Petals spreading, without claws or appendages, or in a few species wanting; ovary not stipitate; fruit a capsule; low herbs.
Styles 3 to 5, distinct; petals present, mostly obvious or relatively conspicuous.—Tribe Alsineae.

Stipules none.
Petals bifid or 2-divided, rarely none; styles 3, 4 or 5, when of the same number as the sepals opposite them.
Capsule cylindric, usually conspicuously elongated and often curved; styles commonly 5, opposite the sepals.....1. CERASTIUM.
Capsule ovoid or oblong, relatively short; styles 3 (or 4).2. STELLARIA.
Petals entire or merely notched, rarely none.
Styles as many as the sepals and alternate with them.....3. SAGINA.
Styles fewer than the sepals.....4. ARENARIA.
Stipules present, scarious; petals entire.
Styles 3; leaves opposite.....5. SPERGULARIA.
Styles 5; leaves apparently whorled.....6. SPERGULA.
Style 1, 3-cleft or -toothed; petals minute or none.—Tribe POLYCARPEAE.
Leaves opposite or in 4s, oblong or obovate.....7. POLYCARPON.
Leaves opposite, subulate, cuspidate.....8. LOEFLINGIA.
Petals none or represented by mere filament-like organs; style 1, 2-cleft or -parted, rarely 3-cleft, or styles 2; fruit a utricle or achene; very small or prostrate herbs.—Tribe ILLECEBREAE.
Sepals distinct or nearly so; stipules present.
Annual; stipules and flowers minute.....9. HERNIARIA.
Perennial; stipules conspicuous, silvery-scarious.
Leaves subulate; sepals very unequal, armed with a divergent spine.....10. PENTACAENA.
Leaves oblanceolate; sepals equal, cuspidate.....11. PARONYCHIA.
Sepals united below into a short tube.
Stipules present.
Staminodes without glands; annual.....12. ACHYRONYCHIA.
Staminodes with glands; perennial.....13. SCOPULOPHILA.
Stipules none; low annual.....14. SCLERANTHUS

B. Sepals united into a tubular calyx.

Petals with conspicuous claws, these with the stamens and ovary frequently raised above the base of the calyx on a stipe; styles distinct; fruit a capsule; stipules none; mostly erect and often tall herbs.—Tribe SILENEAE.
Calyx teeth much shorter than the tube.
Styles 2; capsule opening by 4 short teeth.
Flowers showy.
Calyx ovate, with 5 prominent angles; petals not appendaged.....15. VACCARIA.
Calyx tubular, not angled; petals with scales.....16. SAPONARIA.
Flowers minute; calyx narrow-cylindric, about 15-ribbed.....17. VELEZIA.
Styles 3; capsule opening by 3 or 6 teeth or valves; claw of the petals commonly bearing scales or appendages at its junction with the blade....18. SILENE
Calyx teeth longer than the tube; styles 5; capsule opening by 5 teeth.....19. AGROSTEMMA.

1. CERÁSTIUM L. POWDER HORN

Pubescent herbs with white flowers. Cymes dichotomous with herbaceous or scarious bracts. Sepals 5. Petals 5, retuse or merely bifid. Stamens 10 or 5. Styles 5. Capsule long, slender-cylindric, often curved, usually much exceeding the calyx, dehiscent at apex by 10 teeth, these erect or spreading. Seeds rough, more or less flattened. (Greek keras, a horn, in allusion to the elongated curved capsules.)

Petals shorter than or about equaling the sepals.
Annual; pedicels not longer than the flowers.....1. *C. viscosum.*
Perennial; pedicels longer than the flowers.....2. *C. vulgatum.*
Petals twice as long as sepals; perennial.....3. *C. arvense.*

1. **C. viscòsum** L. MOUSE-EAR CHICKWEED. Erect, 3 to 10 (or 15) in. high, pilose-hirsute and somewhat glandular, especially on the calyx; leaves ovate to elliptic-oblong, sessile, slightly connate, 7 to 12 lines long; pedicels not longer than the sepals; petals equaling or distinctly shorter than the sepals, oblong, bifid at apex, 2 lines long; stamens 10, one or more with reduced or abortive anthers, or sometimes only 5 with anthers, the other 5 represented by mere scale-like filaments; capsule tubular, 4 lines long, about twice as long as the calyx, the slightly curved apex contracted; seeds numerous, minutely muriculate.—Common in fields and by roadsides; nat. from Eur. Mar.-Apr.

2. **C. vulgàtum** L. Biennial or perennial; stems erect or ascending, 9 to 13 in. high; herbage hairy-pubescent throughout and somewhat viscid; lower leaves spatulate-oblong, upper oblong, 5 to 10 lines long; flowers loosely cymose, the pedicels as long as or at length exceeding the calyx; bracts scarious-margined; sepals 2 to 2½ lines long, about as long as the 2-cleft

petals; capsule curved upward, 2 to 3 times as long as the calyx.—Sparingly nat. from Eur. Often in lawns.

3. **C. arvénse** L. FIELD CHICKWEED. Stems from running rootstocks, several from a decumbent very leafy and often matted base, nearly naked above, 5 to 9 in. high; herbage pubescent and often glandular, the pedicels and calyx glandular-pubescent; leaves linear, acute, the upper 1 to 1½ in. long, the lowermost often but half as long; cyme contracted, bearing 1 to 6 flowers; sepals 1½ to 2½ lines long, scarious-margined; petals usually twice as long as the calyx, obcordate, deeply notched; capsule scarcely exceeding the calyx, pendulous on the curved end of the pedicel.—Yosemite; Coast Ranges from San Francisco to Humboldt Co.; N. Am., Eur. Var. MÁXIMUM Holl. & Britt. Stout, tall, 1 to 2 ft. high; leaves elongated; cyme ample, spreading, 10 to 18-flowered; capsule equaling to nearly twice the length of the calyx.—Along the coast, Marin Co. to Humboldt Co.

2. **STELLÀRIA** L. STICHWORT

Low slender mostly glabrous herbs, loving moist ground or shaded habitat. Flowers white, small, axillary and solitary, or terminal and cymose. Sepals 5, acute or acuminate. Petals 5, 2-parted almost to the base into narrow segments. Stamens 3 to 10. Styles 3 or 4. Capsule ovoid or oblong, relatively shorter than in Cerastium, dehiscent to below the middle into as many or twice as many valves as there are styles. (Latin stella, a star, the flowers star-shaped.)

A. Annual; lower leaves ovate, petioled.

Bracts foliaceous; stems procumbent, weak.....1. *S. media.*
Bracts scarious; stems filiform, erect.....2. *S. nitens.*

B. Perennial; leaves ovate, lanceolate, or linear, all sessile or nearly so.

Petals deeply 2-parted; herbage not glandular.
  Bracts small and scarious.
    Petals minute or none; flowers in umbels.....3. *S. umbellata.*
    Petals longer than the sepals; flowers irregularly cymose, the cymes terminal, often reduced to a single long-pediceled flower.....4. *S. longipes.*
  Bracts foliaceous.
    Leaves shorter than internodes; petals shorter than the sepals or none.
      Flowers cymose; leaves mostly lanceolate.....5. *S. borealis.*
      Flowers solitary in the axils; leaves ovate.....6. *S. crispa.*
    Leaves longer than internodes; petals equaling or slightly exceeding sepals; seashore species.....7. *S. littoralis.*
Petals merely retuse or bifid, exceeding the calyx; herbage glandular-pubescent.....8. *S. jamesiana.*

1. **S. mèdia** (L.) Cyr. COMMON CHICKWEED. Slightly succulent, with weak procumbent stems, rooting at the lower nodes; lower leaves ovate, acute, rather abruptly contracted into slender petioles, the upper narrower, sessile; floral bracts foliaceous; pedicels slender, deflexed in fruit; petals shorter than the pubescent sepals; stamens 3, 5 or 10; capsule ovoid, slightly exceeding the calyx.—Common weed along fence lines and ditches and shaded half-waste places generally; nat. from Eur. Feb.-May. Stems with a pubescent line, and petioles of lower leaves hairy.

2. **S. nítens** Nutt. SHINING CHICKWEED. Stems erect, filiform, branching above, 3 to 7 (or 10) in. high, glabrous or slightly hairy below; leaves linear, acute, sessile, 2 to 7 lines long, or the very lowest ovate, 1 to 3 lines long, abruptly contracted into slender petioles nearly twice as long; inflorescence strict, the pedicels erect, ¾ in. long or less, or some of the flowers quite sessile; bracts scarious; sepals scarious-margined, subulate-lanceolate, 2 lines long; petals ½ as long as the sepals, sometimes none; capsule oblong, nearly as long as the calyx.—Grassy hillsides and plains, 100 to 2900 ft.: throughout cismontane Cal., a somewhat obscure plant; n. to B. C., e. to Utah.

3. **S. umbellàta** Turcz. Stems slender, weak, ascending from a rooting base, 3 to 10 in. high; herbage glabrous; leaves ovate to oblong or those above the base oblong-lanceolate, acute, 4 to 8 lines long; flowers in regular or more or less irregular umbels, the umbels terminal on the stem or forks of the cyme; pedicels ½ to 1¼ in. long; sepals ¾ to 1 line long; petals minute or none; capsule twice as long as the calyx.—Montane, 7000 to 8000 ft.;

360. Stellaria longipes Goldie; *a*, fl. branch x ½; *b*, petal x 1.

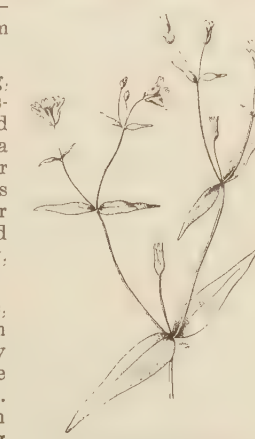
Sierra Nevada from Tulare Co. to Mariposa Co.; White Mts.; e. to the Rocky Mts.; e. Siberia.

4. **S. lóngipes** Goldie. Fig. 360. Stems strictly erect, 5 to 12 in. high, from slender running rootstocks; at high altitudes dwarfish and densely matted; herbage glabrous; lower leaves oblong to linear, 3 to 6 lines long, or the upper linear-lanceolate, 6 to 10 lines long; flowers solitary and terminal, or in irregular terminal cymes, the pedicels of variable length (¼ to 1½ in. long) but commonly strictly erect; calyx 1½ to 2 lines long; petals cleft nearly to the base, equaling or exceeding the sepals; capsule dark or black, exceeding the calyx; seed microscopically and scantily puberulent, nearly smooth.—Common in moist often grassy places in the mts., 4300 to 8500 ft.: San Bernardino Mts.: Sierra Nevada from Tulare Co. n. to Modoc and Siskiyou Cos.; Yollo Bolly Mts. Var. LAÈTA Wats. Herbage glaucous.—Volcano Creek, Tulare Co.; n. Rocky Mts. to arctic Am.

5. **S. boreàlis** Bigel. Stems erect or spreading, weak, sparingly branched, 6 to 10 in. long; herbage glabrous; leaves ovate to elliptic-ovate, acute, 3 to 5 lines long, sometimes a little crisped; flowers in loose terminal leafy cymes, or often solitary in the lower forks or rarely in the lower leaf axils, on pedicels 2 to 4 or 8 lines long; sepals 1½ to 2 lines long, the petals shorter or wanting; capsule greenish or brownish, oblong, nearly a half longer than the calyx; seed microscopically roughened.—Alpine or subalpine, in wet or cool places, 9000 to 12,000 ft., rare with us: San Bernardino Mts.; Kaweah Peak; South Yollo Bolly; Medicine Lake. Var. BONGÁRDIÀNA Fer. Stems 10 to 17 (or 30) in. long; leaves ovate-lanceolate, acuminate, ¾ to 1½ in. long, 1 to 2 (or 3) lines broad; pedicels ¾ to 1½ in. long.—Montane, 4000 to 8500 ft. (Mt. San Jacinto; Sierra Nevada from Tulare Co. to Mariposa Co.) or at low altitudes near the coast from Mendocino Co. to Humboldt Co.; n. to Alas., e. to N. Eng.

6. **S. crìspa** C. & S. Stems ascending or reclining, 4 to 15 in. long, simple above the base or sparingly branched; herbage glabrous; leaves rather remote, ovate, abruptly short-acuminate or very acute, usually crisped on the edges, 2 to 6 (or 9) lines long; flowers solitary in the axils (at every other node or more scattered), on pedicels 3 to 5 lines long; pedicels erect, or often spreading or deflexed in fruit, about half the length of the internode; calyx 1½ lines long; petals divided, equaling the sepals or shorter, or none; capsule straw-colored, ½ longer than the calyx.—Grassy wet meadows, North Coast Ranges from Marin Co. to Mt. Shasta; n. to Alas. May-July.

7. **S. littoràlis** Torr. Stems stoutish, ascending, very leafy, 1 to 2 ft. long; herbage weakly pubescent; leaves rather crowded, ovate, acute, rounded at the sessile base, ¾ to 1¾ in. long; flowers in a terminal compound leafy cyme; pedicels 3 to 5 (or those in the lower forks (7 to 10) lines long; sepals lanceolate, acute, 2 lines long, slightly shorter than the deeply cleft petals; capsule included within the calyx.—Bogs or marshes, seacoast only, San Francisco to Humboldt Co. May-June.



361. Stellaria jamesiana Torr.; infl. x ½.

8. **S. jàmesiàna** Torr. Fig. 361. Stems diffuse, 5 to 12 in. high, from slender rootstocks, often with fusiform-thickened joints; herbage minutely glandular puberulent; leaves narrowly lanceolate to ovate or broadly lanceolate, 1¼ to 2 (or 3) in. long, the pairs horizontally spreading; flowers in loose terminal or axillary cymes on spreading peduncles; peduncles 1 to 2 in. long; pedicels 4 to

10 lines long; sepals 1½ to 2 lines long, the petals twice as long, broadly notched at apex; capsule ovate, shorter than the calyx.—Meadows or pine forest, 5000 to 8500 ft.: Frazier Mt.; Sierra Nevada from Tulare Co. n. to Modoc Co.; North Coast Ranges from Mt. Sanhedrin to Siskiyou Co.; n. to Wash., e. to Rocky Mts.

3. **SAGÌNA** L. Pearlwort

Diminutive herbs with subulate or filiform leaves. Leaves of the opposite pairs scarious-connate at base. Flowers minute, terminal, often long-pediceled. Sepals 5 or 4, obtuse. Petals white, much shorter than the sepals, rarely subequal, mostly minute, entire or slightly emarginate, or sometimes none. Stamens 5 or 10. Styles as many as the sepals and alternate with them. Capsule dehiscent to the base by entire valves. (Latin sagina, fattening, some species abundant in sheep-grazed country.)

Stems filiform; pedicels straight; annuals; low altitudes.
Sepals and petals 5; connate bases of leaves glabrous.....1. *S. occidentalis.*
Sepals 4; petals commonly none; connate bases of leaves ciliolate.....2. *S. apetala.*
Stems stoutish, more or less succulent; herbage wholly glabrous; biennials or perennials.
Petals mostly ½ length of sepals; pedicels curved at summit; high altitudes.....
3. *S. linnaei.*
Petals and sepals subequal; pedicels rarely curved at summit; seashore.....
4. *S. crassicaulis.*

1. **S. occidentàlis** Wats. Western Pearlwort. Inconspicuous annual with almost capillary stems, branching at the base, erect or spreading, 2 to 5 in. high; slightly hispidulous-glandular on the calyx and upper portion of pedicel, otherwise glabrous; upper leaves broadly subulate, acute, 2 to 3 lines long, the lower filiform-linear, 3 to 6 lines long; pedicels 3 to 6 lines long; sepals and petals 5; sepals ¾ line long, the petals nearly as long; calyx rounded at the base; stamens 3 to 10; capsule 1¼ lines in length.—Not uncommon, but obscure and mostly in low ground or borders of salt marshes, 50 to 800 (or 2700) ft.: coastal S. Cal.; Coast Ranges; Great Valley; n. to B. C. Apr.-May.

2. **S. apétala** Ard. Dwarf Pearlwort. Tiny annual, erect, 1 to 2 in. high, usually minutely glandular-pubescent; leaves linear-subulate, acute, 1½ to 3 lines long; pedicels capillary, erect; calyx 4-parted; petals commonly none, or 4, minute and obovate; capsule ovoid, 1½ times as long as the calyx.—Pasadena. Seldom collected but perhaps overlooked. Introduced from Eur.; as also the var. barbàta Fenzl. Leaves with the connate scarious bases more or less ciliolate.—About ranches or near dwellings: Jackson; Ione; Auburn; Crane Creek, Tehama Co.

3. **S. linnaèi** Presl. Arctic Pearlwort. Biennial or perennial; stems numerous, forming a close mat, 1 to 3 in. high, often with leaf-rosettes at base; herbage glabrous; leaves thickish, linear, 3 to 5 or 8 lines long; pedicels filiform, commonly recurved at summit; stamens 10; petals ½ to ¾ the length of the sepals; capsule ovate-conic, 1⅓ to 2 times length of the calyx.—High wet meadows or on rocks, 4000 to 11,000 ft.: San Jacinto, San Bernardino and San Antonio mountains; Mt. Pinos; Sierra Nevada; North Coast Ranges; n. to Alas., thence around the earth. June-July.

4. **S. crassicáulis** Wats. Glabrous perennial, the stems stoutish and succulent, branching, 1 to 5 in. long, decumbent; leaves linear, thickish, 2 to 9 lines long, the basal forming a rosette, the cauline connate by broad scarious membranes; flowers erect or nodding; petals and sepals subequal, 1½ lines long; stamens 10; capsule ovate, little exserted from the fruiting calyx.—Beaches along the coast from Monterey to Tomales Bay; Wash. and B. C. June-July.

4. **ARENÀRIA** L. Sandwort

Low branching annuals, or tufted or matted perennials. Leaves mostly subulate or acerose and pungent, but often linear, lanceolate or ovate. Flowers white, in terminal cymes or heads, rarely solitary and axillary. Sepals 5. Petals 5, entire or nearly so. Stamens 10. Styles 3. Capsule globose or short-oblong, dehiscent into as many entire or 2-cleft valves as there are styles. (Latin arena, sand, in which many species grow.)

A. Capsule valves 2-toothed or 2-cleft.

Leaves linear, lanceolate or ovate (1 or 2 lines broad), not acerose or pungent.
Perennial.
Plants with running rootstocks; leaves linear-lanceolate.....1. *A. macrophylla.*
Plants without rootstocks; leaves oblanceolate to linear.....2. *A. saxosa.*
Annual; leaves ovate.....3. *A. serpyllifolia.*
Leaves subulate or like pine needles, mostly pungent; perennial.
Condensed alpine plant.....4. *A. compacta.*
Taller or more loosely branched plants.
Flowering stems simple, the flowers capitate or umbellate.....5. *A. congesta.*
Flowering stems branching.
Stout or compact; Great Basin species.
Rare; foliage glaucous.....6. *A. aculeata.*
More common; not glaucous.....7. *A. macradenia.*
Slender; high Sierra Nevada.....8. *A. capillaris.*

B. Capsule valves entire.

Lower altitudes, mostly of the foothills.
Swamp plant; perennial.....9. *A. paludicola.*
Dry ground plants; low annuals.
Petals longer than the sepals; common species.
Leaves filiform.....10. *A. douglasii.*
Leaves lanceolate, broad at base.....11. *A. californica.*
Petals shorter than sepals or none; northern border, rare.....12. *A. pusilla.*
High altitudes or alpine; leaves subulate or filiform, rather rigid, mostly pungent; sepals acute or pungent.
Cyme strict, 1 to 4-flowered.....13. *A. propinqua.*
Cyme more or less spreading, several to many-flowered.....14. *A. nuttallii.*

Sect. 1. **Moehringia.**—Seeds with a strophiole; capsule valves 2-cleft.

1. **A. macrophýlla** Hook. Perennial, with running rootstocks; stems ascending or erect, puberulent, 2 to 4 in. high; leaves in 3 to 5 pairs, lanceolate or linear-lanceolate, acute at each end, ¾ to 1½ in. long; peduncles slender, terminal or becoming axillary, 1 to 5-flowered; sepals ovate, acute or acuminate, 1 to 2 lines long, exceeding the petals; capsule ovoid, nearly equaling or a little exceeding the calyx.—Shady slopes in the mountains, often on mossy rocks, 1600 to 4000 ft.: coastal S. Cal. and n. through the Coast Ranges and Sierra Nevada to Siskiyou Co.; n. to B. C. May.

Sect 2. **Euarenaria.**—Seeds without a strophiole; capsule valves 2-toothed or -cleft.

2. **A. saxòsa** Gray. Stems slender, spreading or decumbent at base, arising from a branching root-crown, 5 to 12 in. high; herbage green, glabrous or retrorsely puberulent; leaves oblanceolate to linear, mucronate, 5 to 10 lines long; flowers in a paniculate cyme, more or less leafy-bracteate; sepals narrowly ovate, sharply acute, 1½ lines long, the petals almost or quite equaling them.—Santa Ana Cañon, San Bernardino Mts.; e. to the Rocky Mts.

3. **A. serpýllifòlia** L. Stems several from the base, retrorsely puberulent, 3 to 9 in. high; leaves ovate, acute, 1 to 2 lines long; flowers loosely cymose-paniculate, on pedicels 2 to 4 lines long; calyx-lobes ovate-lanceolate, hispidulose on back, 1½ lines long, twice as long as the petals; capsule ovate, equaling the calyx.—Stream beds, Humboldt Co.; n. to Wash.; nat. from Eur.

4. **A. compácta** Cov. Flowering stems short (½ to 2 in. high), scantily leafy, glandular-puberulent, rising little above the much-branched crown of a perennial taproot; crown cushion-like, densely leafy, 1 to 2 in. broad; leaves linear, thickish, minutely glandular and minutely denticulate, 1 to 2 lines long; flowers solitary in the axils or terminal, on pubescent pedicels 2 to 3 lines long; sepals 1½ to 2 lines long, shorter than the petals.—High montane, 9000 to 11,600 ft.: Sierra Nevada from Yosemite Park to Tulare Co.

5. **A. congésta** Nutt. Flowering stems slender, simple, many from the branching or matted crown of a perennial taproot, densely leafy at base, viscid, 4 to 10 in. high; basal leaves setaceous or needle-like, ciliolate-serrate near the base, ½ to ¾ or 2 in. long; cauline leaves reduced to distant bracts 2 or 3 lines long; flowers congested in a head or close cluster, sessile or on pedicels 1 to 2 lines long; sepals broadly ovate, acute; petals oblong, 2 lines long, considerably exceeding the sepals.—High montane, 6000 to 10,000 ft.: Sierra Nevada from Tulare Co. n. to Modoc Co.; North Coast Ranges from

Lake Co. to Siskiyou Co.; n. to Wash., e. to Col. Var. SUFFRUTÉSCENS Rob. Root-crown woody; stem leaves less reduced; flowers umbellate with pedicels 2 to 4 lines long.—With the species in Cal. and passing into it.

6. **A. acùleàta** Wats. Flowering branches erect, 4 to 6 in. high, nearly naked; branches of the root-crown many, short, densely leafy at summit, forming a dense mat, only a few of them giving rise to flowering branches; herbage minutely glandular; foliage very glaucous; leaves subulate, pungent, 4 to 8 lines long; flowers in a rather close mostly few-flowered cyme; sepals ovate, 2 lines long, acute, the petals 1½ times as long.—Argus Mts., Inyo Co.; e. to Utah, n. to Ore.

7. **A. macradènia** Wats. Flowering stems erect, often swollen at the joints, 8 to 15 in. high, arising from a woody branching crown 1 to 4 in. high and ending above in a loosely branched cymose inflorescence; herbage glabrous, rarely a little viscid; leaves acerose or subulate, obscurely ciliate at base, ¾ to 2½ in. long, the cauline little or not at all reduced and the basal rarely dense or congested; pedicels 4 to 14 lines long; sepals ovate, very acute, 2½ to 3 lines long, the petals equaling or commonly 1 or 1½ lines longer than the sepals; filaments of stamens opposite sepals with glands at base.—Ranges bordering the deserts, chiefly on the desert slopes, 4000 to 7000 ft.: Santa Rosa Mts.; San Bernardino Mts.; San Gabriel Mts.; s. Sierra Nevada; e. to Utah and Ariz.

8. **A. capillàris** Poir. Flowering stems very slender, bright green and viscid, branching, 2 to 8 in. high, numerous from a matted base of short branches crowning a perennial taproot; leaves chiefly basal, subulate, 4 to 6 lines long, or as much as 1¼ in. long, the cauline few, distant, reduced; inflorescence loosely cymose, the flowers on pedicels 2 to 5 lines long; petals elliptic-obovate or oblong, obtuse, exceeding the elliptic acute sepals.—Granite domes and ridges, 6000 to 10,000 ft.: San Bernardino Mts.; Sierra Nevada from Fresno Co. to Sierra Co.; e. to Utah, n. to B. C.; Asia. Var. URSÌNA Rob. More condensed and regularly branched; leaves 2 to 3 lines long; sepals blunter, nearly as long as the petals.—Bear Valley, San Bernardino Mts.

Sect. 3. **Alsine.**—Seeds without a strophiole; capsule valves entire.

362. Arenaria douglasii Fenzl.; *a*, habit x 1; *b*, stamen x 5; *c*, stamen with gland x 5.

9. **A. paludícola** Rob. Glabrous flaccid perennial, the stems procumbent, rooting at the lower joints, sulcate, shining, leafy throughout, 1 to 2½ ft. long or when growing amongst tules or other plants to 5 ft. long; branches few, very long; leaves linear or linear-lanceolate, thickish, acute, ¾ to 2¼ in. long, slightly connate at base; peduncles solitary in the axils, 1 to 2 in. long, spreading or somewhat deflexed; sepals elliptic, nerveless, herbaceous, 1½ to 2 lines long, about half the length of the obovate petals; capsule oblong, shorter than the calyx.—Swamps, rarely collected: Santa Ana River near San Bernardino; Los Angeles; San Francisco; n. to Wash. The angled stems are very noteworthy.

10. **A. douglásii** Fenzl. Fig. 362. Annual, nearly glabrous, sometimes minutely glandular-pilose; stems much branched, 2 to 8 in. high, developing a loosely cymose inflorescence; leaves filiform, 3 to 5 lines long or the lowermost longer; pedicels filiform, 3 or mostly 7 to 13 lines long; flowers numerous;

sepals oblong-ovate, narrowly thin-margined, 1 to 1½ lines long; petals obovate or roundish, conspicuous, ½ again as long as the sepals; filaments opposite the sepals bearing a yellow bidentate gland at base; capsule subglobose; seeds large, smooth, compressed-reniform, acutely margined.—Sterile soil of hillsides or mesas, 100 to 4000 ft.: coastal S. Cal.; n. through the Coast Ranges and Sierra Nevada to Siskiyou Co. Apr.-May.

11. **A. californica** Brew. Stems delicate and filiform, diffusely branching from the base, 1 to 4 in. high, the flowers loosely cymose on pedicels 3 to 8 lines long; herbage glabrous; leaves lanceolate, obtuse, very short, slightly fleshy, 1 to 2 lines long; sepals oblong-ovate, 1½ lines long, the petals oblong, 1½ times as long; filaments without glands at base, those opposite sepals arising from a minute lobe of the glandular disk; seeds small, finely roughened.—Gravelly hillslopes or disintegrating rock outcroppings, 100 to 2000 ft.: Coast Ranges from Mt. Hamilton to Mendocino Co.; Sierra Nevada from Eldorado Co. to Butte Co.; n. to southern Ore. Apr.-May.

12. **A. pusilla** Wats. Stems simple or several from the base, capillary, 1 to 2 in. high; leaves lanceolate, 1 to 2 lines long; sepals ovate-lanceolate, acute, 1 line long; petals lanceolate or narrowly ovate, nearly transparent, shorter than the sepals, or more minute, or none; stamens 3, rarely 4 or 5; capsule scarcely equaling the calyx; seeds smooth.—Dry pine woods, Humboldt and Siskiyou Cos.; n. to Wash. Appears like a reduced form of A. californica.

13. **A. propinqua** Rich. Tufted, 1 to 3 in. high, with numerous filiform stems mostly leafy at base and ending above in a rather strict 1 to 4-flowered cluster; herbage glandular-puberulent; leaves linear-subulate, 1½ to 2½ lines long; flowers small; sepals ovate to ovate-lanceolate, acute, 1 to 1½ lines long, strongly 3-nerved on the back, larger than the petals.—High montane, 8000 ft.: Siskiyou Co.; n. to arctic Am.

14. **A. nuttallii** Pax. Stems prostrate or ascending, many from the crown of a perennial taproot, more or less matted, giving rise to erect flowering branches which are commonly densely leafy at base; herbage glandular-puberulent; leaves subulate, rigid, pungent, 3 to 5 lines long; flowers rather loosely and divergently cymose, on pedicels 3 to 6 lines long; sepals lanceolate, or oblong-lanceolate, very acute, 2 to 2½ lines long, equaling or exceeding the petals.—Lassen Peak and Mt. Eddy; n. to Ore. and Mont. Var. GRÁCILIS Rob. Plant more compact and regular; sepals lanceolate-subulate, acuminate or shortly awn-tipped, 2½ to 3 lines long, the midnerve on the back very strong; petals oval or oblong-ovate, acute or acuminate, much shorter than the sepals.—Decomposed granite, 9000 to 12,000 ft.: Sierra Nevada from Yosemite Park to Farewell Gap; San Bernardino and San Gabriel mountains. Passing into the typical form. Var. GREGÀRIA Jepson. Flowering stems numerous, 3 to 5 in. high, ending above in a cymose panicle, leafy-imbricated at base and borne on ascending or creeping stems arising from the crown of a taproot; herbage purplish or green, clammy or softly viscid-pubescent; leaves subulate, 3 to 5 lines long, blunt; flowers more or less clustered in a many-flowered panicle, 1 to 2½ in. high, the pedicels ½ to 2 (or 3) lines long; sepals often purplish, oblong-ovate or -lanceolate, shortly acute or acuminate, 2 to 2½ lines long, commonly exceeded by the oblong-lanceolate or narrowly obovate petals.—Rocky ridges, 4000 to 7000 ft., North Coast Ranges from Snow Mt. to w. Siskiyou Co. July. Intergrading to the species.

5. SPERGULÀRIA J. & C. Presl. SAND SPURREY

Low herbs, usually of alkaline plains, borders of salt marshes, or maritime. Leaves linear or subulate-filiform, semi-terete, with scarious stipules. Flowers cymose or racemose, the pedicels at length spreading or deflexed. Sepals 5. Petals 5, purplish or white, entire. Stamens commonly 10. Style 3, rarely 5. Capsule 3-valved. Seeds often wing-margined. Embryo annular. (Derivative of Spergula.)

Perennials.
Erect or ascending, more or less succulent, with fusiform fleshy roots; saline or sea-coast habitats.....1. *S. macrotheca.*
Prostrate, not obviously succulent; roots fibrous, not fleshy-fusiform.
Stems long and somewhat straggling, from a matted or tufted center, flowering from the middle to the ends of the branches.....2. *S. rubra.*
Plants matted; flowering mostly at the ends of the branches....3. *S. clevelandii.*
Annuals, quite erect or ascending.
Herbage more or less pubescent; saline habitats.
Capsules slightly longer than the sepals; petals 5, nearly equaling the sepals....4. *S. salina.*
Capsules nearly twice as long as the sepals; petals 3 to 5, ½ to ¾ as long as the sepals.....5. *S. tenuis.*
Herbage glabrous; flowers ½ to 1 line long; dried ponds.....6. *S. platensis.*

1. **S. macrothèca** (Hornem.) Heynh. Stems stout, 7 to 12 in. high, erect or ascending from the short, often branched, woody crown of a very thick and fleshy taproot; herbage deep green and viscid-pubescent throughout, rarely subglabrous; leaves narrowly linear, 1 to 1½ in. long; flowers in terminal cymes, their branches often racemose; pedicels 2 to 7 lines long; sepals 3 to 4 lines long, scarious-margined; petals as long, pink; capsule equaling or a little exceeding the calyx; seeds with or without a wing, even in the same capsule.—Sandy borders of salt marshes, coast region of Cal. Var. LEUCÁNTHA Rob. Glabrous, especially below, or more lightly pubescent: inflorescence looser; flowers commonly white.—Alkaline plains of the interior valleys: Sacramento, San Joaquin and Livermore valleys; s. to S. Cal. May-June. Var. SCARIÒSA (Britt.) Rob. Herbage pale, glandular-pubescent or almost glabrous; stipules ovate, acuminate, 4 to 5 lines long, conspicuously silvery-scarious; flowers scattered and on pedicels 3 to 7 lines long or less, or in reduced terminal cymes.—Sea-bluffs, San Francisco to Monterey. Var. TALÌNUM Jepson. Slightly woody at base; internodes very short (2 to 5 lines mostly), the stems densely clothed with leaves; herbage heavily glandular-pubescent or nearly glabrous; cyme shortly peduncled.—San Clemente Isl.

2. **S. rùbra** (L.) J. & C. Presl. var. **perénnans** (Kindb.) Rob. Stems prostrate, 4 to 9 in. long, slender and wiry, many from a densely tufted base, branching little, flowering from about the middle; herbage comparatively glabrous; leaves narrowly linear, 1½ to 5 lines long; stipules ovate, silvery-scarious, 2 lines long, very conspicuous; pedicels slender, 2 to 3 (or 5) lines long; sepals oblong, acute, 1½ to 2 lines long; petals red or reddish, about equaling the sepals; capsule not exceeding the calyx; seeds with a marginal elevation.—Beaten paths and by roadsides, cent. and n. Cal. Introduced from Eur. and spreading gradually. May.

3. **S. clevelándii** (Greene) Rob. Perennial, the prostrate stems forming deep green mats 5 to 13 in. broad; herbage viscid-glandular; leaves filiform, conspicuously fascicled in the axils, ascending, 6 to 9 lines long, all longer than the internodes; flowers in terminal cymes; sepals oblong, acute, 2 lines long; corolla white, about equaling the calyx; seeds winged or not winged, even in the same pod.—Sandy soil near the ocean: San Diego and San Francisco Cos.

4. **S. salìna** J. & C. Presl. Stems branching, erect, or sometimes diffuse and prostrate, 3 to 8 in. long; herbage somewhat fleshy, nearly glabrous or lightly pubescent; leaves narrowly linear, ¾ to 1⅛ in. long, commonly shorter than the internodes; flowers in terminal cymes, the branches often racemose; pedicels leafy bracted or the upper bractless, not exceeding the capsules; sepals oblong-ovate, obtusish, scarious-margined, 2 lines long, the petals nearly as long; capsule slightly longer than the calyx.—Alkaline plains of the Sacramento and San Joaquin valleys, w. to the salt marshes near the coast, and s. to S. Cal.; n. Atlantic coast; Eur. May-Aug. Var. SÓRDIDA (Greene) Jepson. Leaves dark with a heavy glandular indument; branches of the cymes secund, rather dense.—Marshes about San Francisco Bay.

5. **S. ténuis** (Greene) Rob. Annual; stems dichotomously and copiously branched from the base, erect or diffuse, 3 to 5 in. high, the branches slender and internodes long; herbage scarcely fleshy, lightly viscid-puberulent; leaves linear-filiform, 4 to 7 lines long, shorter than the internodes; flowers

¾ to 1 line long, in terminal cymes, numerous, short-pediceled, the uppermost sessile in close clusters; sepals oblong-ovate; stamens 2 to 5; capsule twice as long as the fruiting sepals or nearly.—Saline plains, Sacramento Valley.

6. **S. platénsis** (Cambess.) Fenzl. Annual; stems numerous, nearly filiform, branching, 1½ to 3½ in. high; herbage glabrous; leaves linear-filiform, 3 to 8 lines long, mostly shorter than the internodes; upper leaves much reduced, not exceeding the scarious stipules; flowers in terminal cymes, the branches somewhat racemose; pedicels 1 to 2 lines long; flowers ½ to 1 line long; petals 1 to 3 and minute, or lacking; capsule somewhat exceeding the sepals. —Dried ponds, S. Cal.; e. to Tex.; Brazil.

6. SPÉRGULA L. Spurrey

Annual. Leaves narrowly linear or subterete, apparently in whorls, but really opposite, several others of their own size being crowded in the axils; stipules small and scarious. Flowers symmetrical. Sepals 5. Petals 5, white, entire. Stamens 10, occasionally 5. Styles 5, alternate with the sepals. Capsule 5-valved, the valves entire, opposite the sepals. Embryo spirally annular. (Latin spargere, to scatter, in reference to the dispersion of the seeds.)

1. **S. arvénsis** L. Corn Spurrey. Diffusely branching from the base, the stems 1 to 2 ft. long; pubescence of short spreading glandular hairs; leaves slightly fleshy, ¾ to 1¼ in. long, numerous in rather remote whorls; flowers white, 4 lines broad, in a cymose panicle with strongly divergent branches turned abruptly downward after flowering; petals ovate.—Fields and orchards near the coast, rarely in the interior; introduced European weed. Readily eaten by cattle and said to increase the flow of milk. The flowers open only of afternoon.

7. POLYCÁRPON L.

Low much-branched annuals with numerous flat leaves, small scarious stipules and very small flowers in cymes. Sepals 5, more or less carinate, scarious-margined. Petals 5, hyaline, shorter than the sepals. Stamens 3 to 5. Style 1, very short, 3-cleft or the stigma 3-lobed. Capsule 3-valved. Seeds several. Embryo little curved. (Greek polus, many, and karpos, fruit, in reference to the numerous pods.)

Leaves in 4s or opposite; inflorescence leafless.....1. *P. tetraphyllum.*
Leaves opposite; inflorescence more or less leafy.....2. *P. depressum.*

1. **P. tetraphýllum** L. Stems diffuse or prostrate, 2 to 5 in. long; herbage glabrous or nearly so; leaves in 4s or opposite, oblong or obovate, short-petioled, 2 to 6 lines long; cyme leafless, many-flowered, dense, the flowers 1 line long, short pediceled; sepals green or purplish, strongly keeled, apiculate-hooded; style slender, ⅔ as long as the ovary; stigma 3-lobed; capsule nearly equaling the calyx.—Beaten gravelly places in the valleys: St. Helena; Vallejo; Berkeley; Santa Barbara; native of Eur. July-Aug.

2. **P. depréssum** Nutt. Plants prostrate, 1 to 3 in. broad with slender stems; leaves spatulate, varying to obovate, obtuse or acute, ½ to 2 lines long; flowers ½ as large as in the preceding; sepals not keeled or scarcely so, about ½ line long; petals white, membranous, linear, ½ as long as the sepals; style very short, 3-cleft.—Mesas and foothills, 100 to 2000 ft.: coastal S. Cal.; Monterey Co.

8. LOEFLÍNGIA L.

Low rigid annuals, dichotomously branched from the base, with subulate leaves and setaceous stipules. Flowers small, sessile in the axils. Sepals acuminate or awn-tipped, the outer with a tooth on each side. Petals 3 to 5, minute or none. Stamens 3 to 5. Style 1, very short or none; stigmas 3. Capsule 3-valved, several-seeded. (Peter Loefling, Swedish traveler of the 18th century.)

Sepals recurved; style very short but present.....1. *L. squarrosa.*
Sepals straight; style none.....2. *L. pusilla.*

1. **L. squarròsa** Nutt. Stems diffusely branched from base, 2 to 5 in. high; herbage glandular-pubescent; leaves cuspidate, squarrose-spreading, 2 to 3 lines long; petals very minute; sepals rather strongly recurved and squarrose; capsule shorter than the sepals.—Valleys, 100 to 200 ft.: coastal S. Cal. n. to the San Joaquin and Sacramento valleys.

2. **L. pusílla** Curran. Much like no. 1 but more delicate; stems spreading. 2 to 3 in. long; sepals narrowly lanceolate, abruptly acute, entire, neither rigid nor squarrose; petals none; stamens 3; capsule as long as the sepals.—Tehachapi Mts., 4000 ft.

9. HERNIÀRIA L.

Ours a very small annual, with minute scarious stipules. Flowers minute, green, in clusters, crowded, sessile. Sepals 5 or 4, united at base. Petals setaceous and minute, or none. Stamens 2 to 5, inserted on the calyx base. Style very short, 2-cleft or -parted. Fruit a 1-seeded indehiscent achene, with a thin pericarp, inclosed in the calyx. (Latin hernia, a rupture, which one species was thought to cure.)

1. **H. cinérea** DC. Tiny erect plants, 1 to 2½ in. high, or sometimes forming prostrate mats 3 to 14 in. broad, the branches bearing 2-ranked branchlets; herbage hispidulous; leaves oblong-oblanceolate, 1½ to 2½ lines long; flowers in all the axils, even the lowest; calyx ½ line long, very hispid.—Foothills on either side of the lower San Joaquin Valley; nat. from Eur.

10. PENTACAÈNA Bartl.

Tufted perennials with subulate pungent leaves and silvery hyaline stipules. Flowers sessile, clustered in the axils. Sepals 5, almost distinct, very unequal, hooded, the 3 outer larger, and with a stout divergent terminal spine, the 2 inner smaller and with a shorter spine. Petals minute, scale-like. Stamens 3 to 5, inserted at the base of the sepals. Style very short, bifid. Utricle inclosed in the rigid persistent calyx. (Greek pente, five, and akaina, a thorn, the five sepals spine-tipped.)

1. **P. ramosíssima** H. & A. Sand Mat. Stems prostrate, forming dense mats 5 to 18 in. broad, pubescent; leaves crowded on the stems, 2 to 4 lines long, the stipules ½ or sometimes nearly as long; calyx 1½ to 2 lines long; sepals hairy or woolly below the divergent spinose apex; utricle apiculate.—Sand-dunes or sandy soil along the entire Cal. coast: n. to Wash., s. to Mex.; Chile.

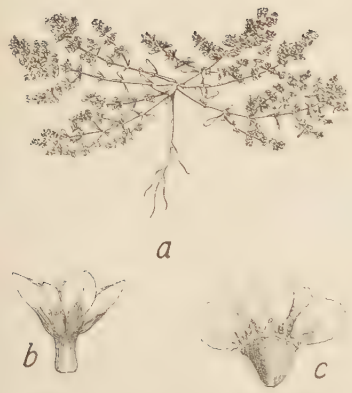
11. PARONÝCHIA L. Whitlow-wort

Prostrate tufted perennial, with scarious stipules and clustered axillary flowers. Sepals 5, almost distinct, equal, linear or oblong, concave or cucullate under the apex, the very tip furnished with a short bristle or cusp. Petals filament-like, or minute teeth, or none. Stamens 5, inserted on the base of the sepals. Ovary 1-ovuled. Style deeply 2-parted. Fruit a utricle inclosed in the persistent calyx, at length bursting longitudinally. (Greek paronuchia, a whitlow or felon, the name applied to an herb used as a remedy.)

1. **P. franciscàna** Eastw. Stems 4 to 12 in. long, tough, the internodes very short (only 1 to 2 lines long at base); leaves oblanceolate, acute, cuspidate, 2 to 4 lines long, much crowded on the branches and branchlets, especially towards the ends; stipules hyaline; flowers 1 line long, obviously pediceled, 3 or 4 in the axils.—Grassy hilltops near the ocean: San Francisco Co. to Sonoma Co.; nat. from Chile.

12. ÁCHYRONÝCHIA T. & G.

Glabrous plants with spatulate leaves and large hyaline stipules. Leaves of the opposite pairs unequal. Flowers bright silvery-white by reason of the scarious calyx-lobes, borne in dense axillary cymose clusters. Calyx-lobes 5. Petals none. Stamens 10 to 15, only 1 to 5 anther-bearing. Style bifid, included. Utricle thin, included in the calyx. (Greek achuron, chaff, and onyx, onychos, a finger nail, in reference to the thin shining calyx-lobes.)



363. Achyronychia cooperi T. & G.; *a*, habit x 2/3; *b*, fl. x 6; *c*, calyx spread open x 6.

1. **A. cóoperi** T. & G. Fig. 363. Stems 2 to 5 in. long, slender, prostrate, radiating from the crown of an annual root; leaves spatulate, 1½ to 9 lines long; flowers 1 line long, in conspicuous dense axillary cymes; calyx-lobes scarious, their lower third fleshy-herbaceous like the urn-shaped calyx-tube. — Sandy washes and valleys. Mohave and Colorado deserts. May.

13. SCÓPULOPHÌLA Jones

Perennial with erect stems and linear leaves. Stems arising from a woody root crown crowded with scales and lacerate-fringed stipules. Flowers sessile in small axillary 1 to 3-flowered clusters. Calyx tube ¼ to ⅓ as long as the lobes, the 5 lobes membranous with a central lanceolate green spot. Stamens 10, 5 fertile, the 5 lanceolate staminodes petaloid, each bearing at base a circular red scale. Style long but not exserted, 3-cleft. Fruit unknown. (Greek skopelos, a rocky peak, and phileo, to be fond of. The plants growing in rocky places in the desert.)

1. **S. rixfórdii** (Bdg.) M. & J. Fig. 364. Stems several, branching, strict, 3 to 5 in. high; leaves 2 to 4 lines long; calyx 1½ lines long, the staminodes as long as the calyx-lobes.—Rocky places, 4500 to 6000 ft.: Owens Valley; e. to southern Nev. (Eremolithia rixfordii Jepson.)

364. Scopulophila rixfordii M. & J.; *a*, habit x ½; *b*, fl. spread open x 8.

14. SCLERÁNTHUS L. Knawel

Indifferent annuals with subulate leaves and no stipules. Flowers small, greenish, clustered. Petals none. Calyx deeply 5-lobed, the cup-like tube indurated and inclosing the utricle. Stamens 10 or 5. Ovary 1-ovuled. Styles 2, distinct. (Greek scleros, hard, and anthos, flower, referring to the hardened calyx-tube.)

1. **S. ánnuus** L. German Knotgrass. Stems much branched, spreading, 2 to 3 in. long; flowers 1 to 1½ lines long, sessile in the forks; calyx 1½ lines long, its lobes narrowly scarious-margined.—Placerville; introd. from Eur.

15. VACCÀRIA Medic.

Glabrous glaucous annual with sessile leaves and showy red flowers in a broad loose flat-topped corymb. Calyx synsepalous, ovate, with 5 prominent angles. Petals 5, clawed, not appendaged. Stamens 10. Styles 2. Ovary 1-celled but with rudimentary partitions at base. Capsule ovate, dehiscent at apex by 4 short teeth. (Latin vacca, cow, some species used for fodder.)

1. **V. vulgàris** Host. Cow-herb. Strictly erect, dichotomously branching above, 2 to 3 ft. high; leaves ovate or the upper lanceolate, 3 to 4 in. long with cordate-clasping base; flowers 7 to 9 lines long; petals red, the blade obcordate and claw linear.—Grain-field weed: Dulzura, San Diego Co.; San Bernardino Val-

ley; Sonoma; College City; Lundy, Mono Co.; Plumas Co.; Honey Lake Valley; Jess Valley and Lake City, Modoc Co.; nat. from Eur.

16. **SAPONÀRIA** L. Soapwort

Ours a stout perennial. Flowers white, in corymbed clusters. Calyx cylindric. Petals with a crest of 2 subulate teeth. Otherwise similar to Vaccaria. (Latin sapo, soap, the mucilaginous juice with saponaceous qualities.)

1. **S. officinàlis** L. Bouncing Bet. Erect, 2 to 3 ft. high, glabrous; leaves ovate, acute, 3 to 4 in. long; blade of petals cuneate-obovate, notched at apex, 6 to 7 lines long.—Escaped garden plant: Sacramento River cañon (Delta and Castella); e. of South Fork Peak, Lassen Co.; native of Eur.

17. **VELÈZIA** Loefl.

Annuals with tough dichotomous stems and sparse foliage. Flowers pink, solitary in the axils of the subulate leaves, or in clusters of 2 or 3, divaricately divergent from the stem, borne on short peduncles or sessile. Calyx slender, elongated-cylindric, 15-ribbed, sharply 5-toothed. Petals small, with minute filiform crests, the blade in ours notched. Stamens 5. Styles 2. Capsule slender, terete, 4-valved at the summit. (Cristobal Velez, friend of Loefling.)

1. **V. rígida** L. Stems slender, trailing, 4 to 8 in. long, in age readily breaking up at the joints; herbage glandular-puberulent; leaves subulate, 2 to 6 lines long; blade of petals 1 line long; capsule sheathed by the calyx, 6 to 7 lines long; seeds laterally meniscoid.—Dry foothills: La Grange, Stanislaus Co.; Hupa, Humboldt Co.; introduced from s. Eur.

18. **SILÈNE** L. Catch-fly. Campion

Annual or perennial herbs, more or less viscid and mostly large-flowered. Calyx tubular or inflated, 5-toothed. Petals 5, with long claws, these sometimes with auricles at summit; junction of the claw and blade commonly furnished with 2 scales; blades spreading, entire, or more commonly cleft or laciniate. Stamens 10. Styles 3, rarely 4. Capsule opening by 3 or 6 teeth at apex. (Greek sialon, saliva, the stems and other parts being viscid.)

A. Annuals.

Calyx-ribs conspicuous, about 20-nerved.....1 *S. multinervia.*
Calyx 10-nerved, the nerves sometimes weak or obscure.
Internodes not glandular; flowers in one-sided racemes.....2. *S. gallica.*
Upper internodes with a glandular black band; flowers in cymes or panicles.....
3. *S. antirrhina.*

B. Perennials.

1. Flowers large, mostly ¾ to 2 in. broad (except no. 7); petals 4 to 6-cleft; stems leafy.

Corolla crimson; mostly low altitudes.
Plants 2 to 5 ft. high; corolla ½ to ¾ in. broad.....4. *S. laciniata.*
Plants mostly ½ to 1 ft. high; corolla 1 to 1½ in. broad.....5. *S. californica.*
Corolla white, yellowish or pink; plants mostly 3 to 7 in. high.
Herbage grayish; corolla much exserted; north coast.....6. *S. hookeri.*
Herbage dull or yellowish green; corolla scarcely exserted; high montane, S. Cal...
7. *S. parishii.*

2. Flowers smaller, mostly 3 to 6 (or 10) lines broad.

Flowers solitary in the upper axils or terminal, the stems very leafy throughout.
Calyx broadly turbinate-campanulate; flowers nodding on deflexed pedicels; petals 4 to 6-cleft.....8. *S. campanulata.*
Calyx broadly oblong; flowers erect; petals notched, the lobes divergent.....
9. *S. menziesii.*
Flowers mostly scattered in a naked panicle or rarely solitary; stems mostly leafy at base or on lower part.
Flowers nodding or mostly so; stamens and style long-exserted.
Petals 4-cleft.....10. *S. lemmonii.*
Petals 2-cleft.....11. *S. bridgesii.*
Flowers erect or mainly so; stamens and style included or little exserted.
Mostly of middle altitudes or on the sea coast.
Calyx campanulate, cleft to the middle or nearly, about ½ as long as the corolla; petals 4-toothed; scales none.....12. *S. aptera.*
Calyx toothed at summit, its teeth relatively short; scales present.

Calyx narrowly cylindric.
Auricles none or feebly developed; scales long-lanceolate, entire.
Petals 4-cleft; capsule long-stiped.....13. *S. occidentalis.*
Petals 2-cleft; capsule sessile.....14. *S. pectinata.*
Auricles present; scales various; capsule stiped.
Petals 4-cleft; scales laciniate or fimbriate.
Ovary with minute valvular cap; claws glabrous; leaves mostly 2 to 6 lines broad.....15. *S. montana.*
Ovary with conspicuous valvular cap ⅓ as long as the ovary; claws wooly; leaves mostly ½ to 1 line broad.....16. *S. bernardina.*
Petals 2-cleft; scales entire or toothed, not fimbriate; claws woolly.....17. *S. verecunda.*
Calyx oblong-campanulate; petals unequally 4-cleft; claws glabrous; sea coast.....18. *S. grandis.*
High montane, mostly above timber line; calyx broadly cylindric or oblong-campanulate.
Stems from a loosely branched crown.....19. *S. douglasii.*
Stems caespitose.
Leaves 2 to 3 lines broad.....20. *S. grayi.*
Leaves mostly 1 line broad.....21. *S. watsonii.*

1. **S. múltinérvia** Wats. Annual; stems erect, simple or branching from the base, 7 to 16 in. high; herbage pubescent throughout, viscid-glandular above; leaves linear to lanceolate, 1 to 2 in. long; flowers short-pediceled in close terminal clusters on the unequal branches of the cymosely forked inflorescence, or on mostly long (3 to 15 lines) pedicels in the forks; calyx ovate, broadly so in fruit, 3 to 4 lines long, about 20-ribbed, the ribs strong and equally prominent; petal blades small, pink, 2-cleft with obtuse lobes, without scales, not exceeding the subulate spreading calyx-teeth or very little; claws without auricles; capsule nearly sessile, ovate.—Coast region, Marin Co. to Santa Barbara Co. and the Santa Barbara Isls.

2. **S. gállica** L. Windmill Pink. Erect, simple to freely branched, 10 to 15 in. high, hirsute or hispidulous with spreading hairs; leaves spatulate-obovate, 1 to 1½ in. long; flowers in a mostly 1-sided raceme on very short (1 to 2 lines long) pedicels; corolla white or flesh-color, 3 to 4½ lines broad; petal blades obovate and entire, the scales small; ovary almost completely 3-celled.—Weed everywhere in fields and along roadsides, the only common pink; nat. from Eur. The petals are commonly twisted one-fourth round or nearly so, thus resembling the fans of a turbine windmill. Flowers not withering early in the morning. Apr.-May.

3. **S. antirrhina** L. Sleepy Catchfly. Stems erect, slender, sparingly branched, 1 to 2 ½ ft. high; herbage minutely puberulent below, mainly glabrous above, the upper internodes with a black glandular band at the middle; leaves oblong-lanceolate or linear, 1 to 2 in. long; inflorescence paniculate; pedicels 3 to 6 lines long, filiform; flowers small; petals pink or red, emarginate, the blade 1 line long; scales minute; capsule ovoid, 3 lines long.—Sandy soil, almost throughout Cal., but nowhere common.

4. **S. láciniàta** Cav. Stems branching from the base, stiffly erect or climbing amongst bushes, knotty below, 2 to 5 ft. high; herbage finely scabrous-puberulent and a little glandular; leaves elongated and narrowly lanceolate, or linear-lanceolate, and acute, sometimes varying to obovate, 2 to 6 in. long, narrowed to a sessile base; flowers terminal on the branches of a naked panicle, sometimes in clusters, crimson, ½ to ¾ (or 1) in. broad; calyx cylindric, 8 to 9 lines long, its obtuse teeth 1 line long; petals narrow, deeply 4-cleft into lanceolate divisions; scales erect, denticulate; capsule oblong, usually exserted at maturity.—Foothills, 500 to 5300 ft.: coastal S. Cal., n. to San Luis Obispo Co.; e. to N. Mex., s. to Mex.

365. Silene californica Dur.; fl. x 1½.

5. **S. califórnica** Dur. INDIAN PINK. Fig. 365. Stems 1 or several, erect or half-erect, very leafy, ½ to 1 ft. high or reclining amongst bushes and up to 3⅔ ft. high; herbage puberulent and more or less glandular; leaves elliptic-ovate or ovate to oblanceolate, more or less abruptly acuminate, 1 to 3½ in. long; pedicels ½ to 1½ in. long; calyx oblong, soon turbinate- or obovate-distended, 7 to 11 lines long, its teeth lanceolate; corolla crimson, 1 to 1¼ in. broad; petals deeply 4-cleft, the middle segments the longer, all the segments toothed, or the lateral entire or rarely all entire; scales 2 to 4, conspicuous, incurved; capsule obovoid, 6 to 8 lines long, not exceeding the broad calyx; seeds regularly papillate, the papillae with a depression in the center.—Open woods of cañons: Tehachapi Range; Sierra Nevada from Tulare Co. to Shasta Co., 2000 to 5000 ft.; Coast Ranges from Santa Cruz Co. to Del Norte Co., 800 to 2000 ft.; n. to southwestern Ore. The most widely distributed native Silene in cent. and n. Cal.

6. **S. hóokeri** Nutt. Stems several, 3 to 5 in. high, erect or decumbent, arising from slender rootstocks derived from the crown of a perennial taproot; herbage grayish pubescent or glabrate; leaves obovate to oblanceolate, attenuate at base, acute at apex, 1 to 2 in. long; flowers few, solitary in the upper axils, or often only a single terminal one; calyx at first clavate-tubular, 8 to 10 lines long, 1½ to 2 lines broad, its lanceolate teeth ¼ as long as the tube; calyx in age strongly turbinate, becoming 4 lines broad; corolla white or pink, 1 to 2 in. broad; petals deeply slashed into 4 laciniate or linear entire or cleft lobes; scales conspicuous, only the very tips free, entire or notched; capsule globose-ovate.—Open woodlands: Mendocino Co. and n. to western Ore. May-June.

7. **S. parishii** Wats. Stems several from the slender branching crown of a fleshy taproot, 4 to 7 or 10 in. high; herbage including the calyx densely pubescent; leaves narrowly or sometimes broadly lanceolate to oblanceolate, acuminate, ¾ to 1¼ in. long; flowers in terminal 1 to 4-flowered clusters; calyx yellowish, broadly cylindric, 8 to 11 lines long, the lanceolate teeth 2 to 3 lines long; corolla white or lemon-yellow, little exserted from the calyx, about 5 to 7 lines broad, the blades of the petals cut nearly to base into about 4 narrowly lanceolate or subulate segments, with a supplementary tooth on each side at base; seeds with a double marginal crest of flattened tubercules.—Among rocks or in loose granitic soil in pine forest, 8000 to 11,000 ft., chiefly north slope: San Gabriel Mts.; San Bernardino Mts.; San Jacinto Mts.

8. **S. campanulàta** Wats. Stems erect, leafy, many from the thick crown of a perennial taproot, 9 to 11 in. high; herbage green, finely glandular-puberulent; leaves oblanceolate to ovate, acute to acuminate, sessile, ¾ to 1 in. long; flowers racemose, on deflexed pedicels 3 to 4 lines long; calyx broadly campanulate, 4 to 6 lines long, its broad rounded teeth ⅓ to ½ as long as the tube; petals greenish white or flesh-tinted, 4 to 6-cleft into linear lobes, the lobes 2-cleft at apex; auricles broad; scales well developed, several cleft and toothed. — Northern Mendocino Co. to western Siskiyou Co. Var. GRÈENEI Wats. Finely and often rather densely pubescent to glabrous, but not at all or scarcely glandular.—Western Siskiyou Co. Var. PETRÓPHILA Jepson. Stems and leaves puberulent, not glandular, glaucous; leaves ovate; petals pale yellow.—Salmon Summit, sw Siskiyou Co.

366. Silene lemmonii Wats.; fl. x 2½.

9. **S. menzièsii** Hook. Stems slender, erect, very leafy, 3 to 11 in. high, arising from slender branching rootstocks derived from a perennial root; herbage puberulent; leaves obovate to oblanceolate, tapering to base, acute or short-acuminate at apex, ½ to 1½ in. long; flowers

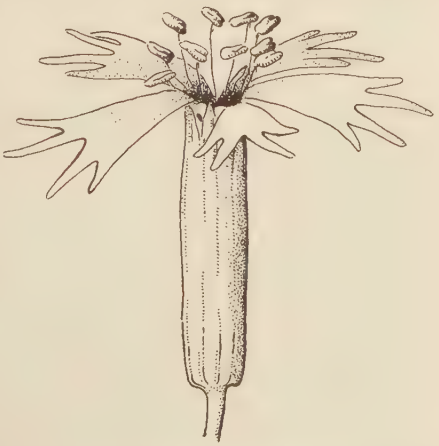
few in the axils of the reduced upper leaves, on pedicels 4 to 6 (or 15) lines long; calyx oblong, 2 to 3 lines long; corolla 3 to 4 lines broad; petals narrowly fan-shaped, deeply and broadly notched, with or without small lateral teeth; claws without scales or with small ones.—Montane, 3000 to 9000 ft.: San Bernardino Mts.; Sierra Nevada from Tulare Co. n. to Modoc Co., thence w. to Humboldt Co.; n. to Brit. Am., e. to Mo.

10. **S. lemmònii** Wats. Fig. 366. Stems slender, erect, very leafy at base, 8 to 14 in. high, arising from the slender branched rootstocks crowning a deep-seated taproot; herbage puberulent and somewhat glandular; basal leaves narrowly obovate, acute, narrowed at base, ¾ to 1¼ in. long; stem leaves similar or linear or lanceolate, the upper remote and much reduced; flowers nodding, in a narrow few-flowered panicle; calyx 3 to 3½ lines long, oblong (soon turbinate-distended by the ovoid capsule), scarious, with 10 green nerves, the alternate ones ending in the short rounded teeth; corolla dull or pale yellowish white, 4 to 6 lines broad; blade of petals 4-cleft into linear-subulate segments, the segments entire or rarely lobed; scales entire or 2-toothed, erect; auricles broad, rounded; claws woolly-pubescent; stamens long-exserted, twice as long as the corolla.—Open pine forest in the mts., 4000 to 6500 ft.; Cuyamaca Mts. to the San Bernardino Mts. and San Gabriel Mts.; Sierra Nevada from Tulare Co. n. to Modoc and Shasta Cos. The most common Silene in the coniferous belt.

367. Silene aptera Greene; fl. x 2.

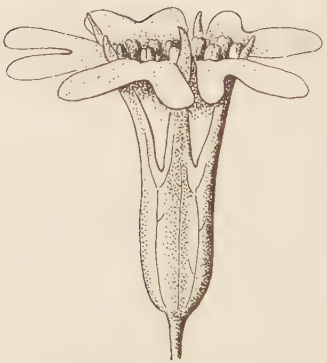
11. **S. bridgèsii** Rohrb. Stems 1 to 4 from the crown of a taproot, leafy, 1½ to 2½ ft. high; herbage glandular-puberulent; leaves sessile, lanceolate to oblanceolate, acute or acuminate, sometimes varying to oblong-lanceolate, 1 to 2½ in. long; flowers nodding, verticillately racemose or in a narrow loose panicle with spreading branches; calyx nearly cylindric, soon clavate or obovate in fruit, 3 to 5 lines long, the teeth acute or lanceolate, ¼ to ⅓ as long as the tube; corolla white or purplish, 5 to 8 lines broad; petal blades 2-cleft into linear segments; scales lanceolate; stamens and style long-exserted; capsule ovate-globose.—Montane, 4000 to 8700 ft.; Sierra Nevada from Amador Co. to Tulare Co.

12. **S. áptera** Greene. Fig. 367. Stems very slender, erect, 9 to 14 in. high, one or several from the condensed crown of a taproot, the leaves chiefly basal, the stems with mostly a single pair at or near the middle; herbage minutely pubescent; leaves linear or linear-subulate, 1½ to 3¼ in. long, ½ to 1¼ lines wide; stems 1-flowered, or few-flowered and loosely cymose; calyx campanulate, 3½ to 4½ lines long, cleft to the middle or below into lanceolate acute scarious-margined lobes; corolla nearly twice as long as the calyx, 5 to 7 lines broad; petal blades shallowly 4-notched or -lobed, the broad claws hairy-tomentulose; scales and auricles none; capsule oblong, exceeding the calyx.—Hockett Mdw., Tulare Co., 8500 to 9000 ft.



368. Silene occidentalis Wats.; fl. x 2.

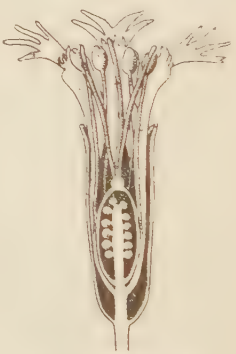
13. **S. occidentàlis** Wats. Fig. 368. Stems erect, 13 to 19 in. high, 1 to 4 from the crown of a stout taproot; herbage viscid-glandular; basal and lower leaves narrowly obovate or oblanceolate,



369. Silene pectinata Wats.; fl. x 2.

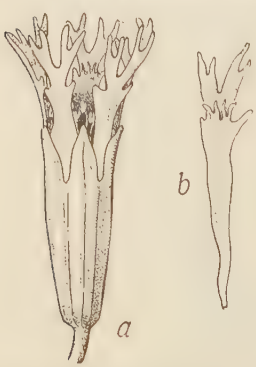
acute, narrowed gradually at base into a long slender margined petiole, 2 to 4½ in. long, the upper linear or lanceolate, acuminate, 1 to 2 in. long; flowers terminal on the forks of a loosely branched panicle; calyx narrowly tubular or soon slightly distended above the middle, 6 to 9 lines long, its teeth obtuse; corolla purple or dull white, 6 to 10 lines broad; petal blades cuneate, cleft half way into 4 or 5 linear or lanceolate segments; claws without teeth or auricles; scales linear or lanceolate, nearly entire; capsule oblong-cylindric, 5 to 6 lines long, on a stipe 2 lines long.—Montane, 4400 to 6000 ft., n. Sierra Nevada from Alpine Co. to Modoc Co. Var. NÁNCTA Jepson. Panicles loose, broad, with white flowers; blade of the petals cut into 2 divergent lanceolate lobes, each with one small lateral tooth; scales lanceolate, very long, entire.—Hockett Mdw., Tulare Co.

14. **S. pectinàta** Wats. Fig. 369. Stems erect, 1½ to 2½ ft. high, 1 or 2 (or several) from the crown of a stout taproot, the leaves in a coarse tuft at base or the lower part of the stem with a few remote pairs; herbage very gummy or glandular-pubescent; leaves elliptic-ovate to lanceolate, acute or acuminate, 2 to 3½ in. long; flowers erect, few in a narrow or rather strict panicle; calyx cylindric, soon turbinate-distended or ovoid, 5 to 6 lines long, the teeth long-lanceolate, ⅓ to ½ as long as the tube and usually exceeding the mature capsule; corolla deep red, 6 to 8 (or 9) lines broad; petal blades cuneate, broadly notched, with rounded lobes; scales lanceolate or subulate, entire or notched; capsule ovoid, sessile or nearly so, 3 to 4 lines broad.—E. slope Sierra Nevada, from Mono Co. to Lassen Co., thence w. on the interior plateau to ne. Shasta Co.



370. Silene montana Wats.; long. sect. fl. x 2.

15. **S. montàna** Wats. Fig. 370. Stems several to many, erect, 9 to 16 in. high, from the branching crown of a taproot; herbage puberulent, glandular above; leaves narrowly linear-lanceolate or -oblanceolate, 1 to 2¼ in. long; flowers in a spicate panicle; calyx cylindric, soon clavate-distended, 6 to 7 lines long, its short teeth very acute and narrowly scarious-margined; corolla greenish white to rose, 4 to 7 lines broad; petal blades cut at apex into 4 (or 6) narrow segments; scales 2, fimbriate or toothed; auricles roundish, commonly denticulate; filaments scarcely exserted; capsule slender-cylindric, tapering to apex, 4 to 5 lines long, included, its stipe 1½ to 2 lines long.—Montane, 4000 to 6500 ft.: White Mts.; Sierra Nevada from Tulare Co. to Lassen Co.; Mt. Hull, Lake Co.

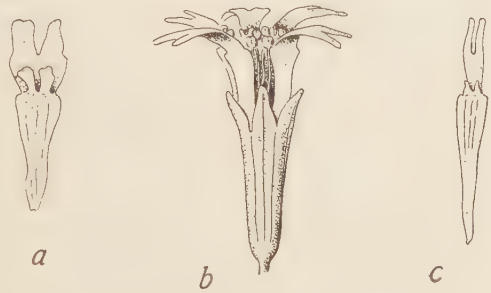


371. Silene bernardina Wats.; *a*, fl.; *b*, petal. x 2.

16. **S. bernardìna** Wats. Fig. 371. Stems erect, densely leafy at base, 7 to 15 in. high, several to many from the loosely branching crown of a stout taproot or sometimes caespitose; herbage dark green, glandular-puberulent throughout, or often grayish pubescent below; leaves grass-like, narrowly linear- or subulate-lanceolate, acuminate, 10 to 16 lines long, ½ to 1 (or 2) lines wide; flowers in a narrow panicle; calyx cylindric, at length

turbinate-distended, 6 lines long, its teeth broadly lanceolate, acute, scarious-margined, 1 to 1½ lines long; corolla white, nearly half longer than the calyx, 3 to 4 lines broad; petal blades 4-cleft, or deeply 2-cleft with the divergent lobes again 2-cleft to middle; claws commonly sparingly woolly on lower part; scales long, laciniate nearly or quite to the base; auricles rounded or lanceolate; capsule ovoid, 3½ to 4 lines long, long-stiped.—Montane, 5000 to 8000 ft.: Sierra Nevada from Fresno Co. to Tulare Co.

17. **S. verecúnda** Wats. Fig. 372a. Stems erect or decumbent, several from the branching crown of a stout taproot, leafy along the lower part of the stem and also very leafy at base, ½ to 1 ft. high; herbage finely pubescent below, glandular-viscid above; leaves linear-lanceolate, acuminate; flowers in 1 to 3-flowered peduncled clusters scattered along the simple or sparingly branched flowering stems, the pedicels short and stout; calyx densely pubescent and also glandular, cylindric, 5 to 6 lines long, or becoming clavate or obovate as the fruit develops; corolla rose-color, 4 to 6 lines broad; petal blades cleft to the middle into 2 entire or slightly toothed oblong lobes, and with 2 nearly obsolete lateral lobes or rounded teeth: scales broadly oblong, obtuse or often notched; claws woolly pubescent; auricles rounded; capsule ovoid, slightly exserted, sessile or stiped; seeds papillate. the papillae developed into a crest on the margin.—Coast Ranges from San Francisco s. to the Santa Ana Mts., passing into the variety. May-Sept. The stipe is very variable in length. Var. PLATYÒTA Jepson. Fig. 372b, c. Stems slender, branching above and forming a mostly open panicle with scattered flowers on long pedicels or sometimes in 3-flowered short-peduncled clusters; basal leaves oblong- to linear-oblanceolate, narrowed at base to a margined petiole, 1½ to 4 in. long; calyx lightly pubescent; petals pink, purple, or (?) greenish white, very narrow; scales mostly lanceolate or linear; auricles rounded or acute.—High montane, 5000 to 9000 ft.: s. Sierra Nevada from Fresno Co. to Tulare Co.; San Gabriel, San Bernardino, San Jacinto and Cuyamaca mountains.



372. Silene verecunda Wats.; *a*, petal; *b*, var. platyota Jepson, fl.; *c*, petal. x 2.

373. Silene grandis Eastw.; fl. x 2.

18. **S. grándis** Eastw. Fig. 373. Stems ¾ to 2 ft. high, very stout, strongly thickened at the nodes, unbranched, densely leafy, bearing peduncled or subsessile clusters of flowers in the axils of the somewhat reduced upper leaves; stem leaves roundish-ovate, shortly acute, 1 to 2 or 3 in. long, sessile or drawn down to a margined petiole, the pairs connate-clasping by a broad base; basal leaves similar but long-petioled; calyx oblong-campanulate, 5 to 7 lines long, scarious between the green nerves, which are densely hairy or velvety, its teeth roundish, scarious margined; petal blades unequally 4-cleft, the two middle ones longer, truncate, toothed or shortly cleft, the lateral very small, lanceolate, strongly divergent; scales quadratish, truncate, toothed; claws glabrous; auricles narrow, rounded; capsule oblong, stipitate, slightly exceeding calyx.—Sea bluffs of Marin and Sonoma Cos. Var. PACÍFICA Jepson.

Much more slender and less densely leafy; leaves narrower, the basal 2 to 3 in. long on petioles nearly twice as long; claws glabrous.—Sea coast, San Francisco to Eureka. A transition to S. verecunda.

19. **S. douglásii** Hook. var. **monántha** Rob. Stems erect, several from the loosely branching crown of a taproot, 10 to 20 in. high, the leaves chiefly basal, the stem with mostly 1 or 2 remote pairs; herbage very minutely pubescent or nearly glabrous, especially below; leaves linear-lanceolate to oblanceolate, tapering to both ends, 1 to 2½ in. long; stems (or the main branches) 1 or more commonly 3 to 5-flowered; calyx oblong-cylindric, soon inflated and oblong-campanulate, 6 to 7 lines long, its teeth roundish, often a little constricted at base, obtuse at apex or at length with the membranous margins inflexed and thus acute; corolla dull white, 5 to 8 lines broad; petal blades 2-cleft, the lobes entire; claws somewhat exserted; scales oblong entire; auricles obtuse or acute; capsule elliptic or oblong, 4 to 5 lines long included, on a stipe 1½ lines long.—Montane, 6000 to 8000 ft.: Placer Co n. to Modoc Co., thence to w. Siskiyou Co.

20. **S. gràyi** Wats. Stems erect, caespitose, 4 to 7 in. high, arising from the branching crown of a taproot; herbage finely puberulent, glandular above; leaves linear to oblanceolate, 5 to 8 lines long, mostly 2 to 3 lines broad, somewhat fleshy, densely crowded at base, the cauline pairs few and reduced; flowers 1 to 4 or 5, in a loose terminal cluster; calyx purplish, broadly cylindrical, soon ovoid-distended, 5 lines long, the teeth rounded; corolla pink, 3 to 4 lines broad; petal blades bifid, the segments each bearing a lateral tooth; scales lanceolate; auricles narrow, truncate, capsule obovoid, 4 to 5 lines long, the stipe almost none.—High montane, above timber line, 7000 to 8000 ft.: Medicine Lake Mts.; Mt. Shasta; Mt. Eddy; near Preston Peak.

21. **S. watsònii** Rob. Fig. 374. Flowering stems densely caespitose on the branched crown of a taproot, 3 to 5 in. high, nearly filiform; herbage glandular-puberulent; leaves mostly crowded at base, narrowly linear to narrowly oblanceolate, ¼ to 1½ in. long, rarely exceeding 1 line in breadth; flowering stems with 1 terminal flower or often with 1 to 3 lateral short-peduncled flowers racemosely scattered below the terminal flower, sometimes a lateral flower replaced by a 2-flowered cluster; calyx purplish, broadly cylindric or soon becoming obovate, 5 to 6 lines long, its teeth obtusish, scarious-margined; corolla white or rose-color, 4 to 6 lines broad; petal blades 1 to 2 lines long, bifid, the lobes obtuse, laterally short-toothed or entire; scales quadrate and obtuse, or 2-cleft; styles 3 (or 4), spirally twisted and exserted in anthesis; capsule cylindric-ovoid.—High montane, above timber-line, 6500 to 12,000 ft.: Sierra Nevada from Tulare Co. n. to Siskiyou Co., n. to Ore.

374. Silene watsonii Rob.: *a*, fl.; *b*, petal; *c*, another petal, typical form. x 2.

19. AGROSTÉMMA L.

Tall hairy annual with linear exstipulate leaves. Flowers few, solitary, purplish-red, long-peduncled. Calyx-tube ovoid, with 10 strong ribs, the 5 teeth conspicuously prolonged into foliaceous lobes exceeding the 5 large entire unappendaged petals. Stamens 10. Capsule coriaceous, dehiscent by 5 teeth. (Latin ager, a field, and stemma, a wreath, the showy flowers in ancient times made into garlands.)

1. **A. githàgo** L. Corn Cockle. Erect, rather strictly branching, 1½ to 2 ft. high, hirsute with long ascending or somewhat appressed whitish hairs, especially on the peduncles and calyx; leaves 2 to 4 in. long, 1½ to 2½ lines wide, tapering to the acute apex; calyx-teeth ⅝ to ⅞ in. long, rather longer than the tube, or in age much longer and eventually deciduous from it; corolla ⅞ to 1½ in. in diameter; blade of petals obovate, black-dotted toward the claw.—Occasional grain-field waif: San Bernardino; St. Helena; College City; Live Oak; native of Eur.

CERÁTOPHYLLÀCEAE. Hornwort Family

Aquatic submerged fragile herbs, with cylindric jointed stems. Leaves whorled, sessile, 2 to 3 times cut into linear or filiform divisions. Flowers minute, axillary, monoecious, without perianth but surrounded by an 8 to 12-cleft persistent involucre. Staminate flower consisting of numerous sessile anthers crowded on the receptacle. Pistillate flower consisting of one pistil; ovary superior, 1-celled, with a single ovule. Fruit indehiscent, beaked by the slender persistent style, spinose or tuberculate at base.

1. CÉRATOPHÝLLUM L.

The only genus. (Greek keras, a horn, and phullon, a leaf, the leaves cut into slender rigid divisions.)

1. **C. demérsum** L. Hornwort. Stems slender, ½ to 2 ft. long; leaves in whorls of 6 to 8, the segments prickly-dentate, ¼ to 1 in. long; style as long as and forming a beak to the achene; achene variable, 1 to 2 lines long, with a horn or reflexed spur on each side near the base or spurless, the margin winged or wingless, and the sides sometimes tuberculate.—Ponds and lakes, widely distributed in Cal.; all continents. Aug. Seldom collected in fruit.

NYMPHAEÀCEAE. Water-lily Family

Aquatic perennial herbs with horizontal rootstocks or with tubers. Leaves floating or erect, peltate or deeply cordate. Flowers large, solitary, complete, on long peduncles. Sepals 3 to 12. Petals 3 to many. Stamens 6 to numerous. Carpels 3 to many, superior, united into a single pistil with many cells, or distinct.

Petals many; pistil 1, compound ..... 1. Nymphaea.
Petals 3 or 4; pistils several, distinct ..... 2. Brasenia.

1. NYMPHAÈA L. Pond Lily

Aquatic or subterrestrial plants. Scapes and leaves from creeping rootstocks. Leaves cordate; petioles long. Sepals 5 to 12, conspicuous, orbicular, concave, mostly petal-like, unless at base or on the outside. Petals 10 to 20, small and thick, bearing more or less resemblance to staminodia. Stamens numerous, densely imbricated around the ovary, at length recurving; anthers linear; filaments very short. Ovary 10 to 25-celled, the stigmas radiating upon its truncate or disk-like summit. Fruit coriaceous-baccate. (Latin name of the water-lily.)

1. **N. polysépala** (Engelm.) Greene. Indian Pond Lily. Leaves 6 to 11½ in. broad, 7 to 14½ in. long, rounded at apex, the lobes rounded and the narrow or closed sinus ⅛ to ½ the length of the blade; calyx yellow or brownish red, subglobose or somewhat cup-shaped, 3 (or when fully expanded 4 to 5) in. in diameter; sepals 9 to 12; petals 12 to 18, nearly or quite concealed beneath the many stamens; anthers dark red; stigmatic rays 10 to 24; fruit ovate or subglobose, 1 to 1½ in. in diameter, with short constricted neck and convex disk.—Ponds: near the coast, Santa Cruz Co. to Humboldt Co., 100 to 500 ft.; higher mts., 4500 to 7500 ft. (Yollo Bolly Mts. to Siskiyou Co.; Sierra Nevada from Mariposa Co. to Lassen Co.); n. to Ore.

2. **BRASÈNIA** Schreb.

Leaves peltate, oval, floating, long-petioled from fleshy creeping rootstocks. Flowers small, dull purple. Sepals and petals 3 or 4. Stamens 12 to 18 with filiform filaments. Carpels 4 to 18, distinct, becoming indehiscent clavate pods. (Derivation unknown.)

1. **B. schrèberi** Gmel. WATER SHIELD. Leaves 1½ to 4 in. long; petals linear, about 6 lines long.—Lakes and slow streams, 35 to 6200 ft.: Kern Cañon; Stockton; Lakeport; Lake Leonard, n. Mendocino Co.; Pitt River near Ft. Crook.

RANUNCULÀCEAE. BUTTERCUP FAMILY

Herbs with alternate or basal leaves (excepting the opposite-leaved climber Clematis). Flowers with the parts all free and distinct, commonly perfect, solitary, or in terminal racemes or panicles. Sepals usually 5, always more than 2, often petal-like. Petals usually 5, often more, sometimes minute or altogether wanting. Stamens indefinite, usually numerous. Pistils several, superior, always 1-celled, bearing a single style. Fruit a follicle or achene rarely a berry. Seeds containing abundant endosperm and a minute embryo. —Leaves mostly palmately divided or lobed, in all cases without stipules, but the petioles often with a broad sheathing base. Flowers regular, except in Delphinium and Aconitum, and most frequently with a pronounced convex receptacle. Species of Thalictrum and Clematis are dioecious or polygamo-dioecious. Actaea has only 1 pistil. In Paeonia the petals and stamens are inserted on a fleshy disk.

A. Ovary several to many-ovuled; fruit a follicle (a berry in no. 5).

Flowers regular, without spurs.
- Petals not spurred.
  - Flowers solitary, rarely 2 or 3.
    - Petals present.
      - Flowers brownish red; petals roundish, inserted on a fleshy disk. . . . . 1. PAEONIA.
      - Flowers white; petals linear; disk none. . . . . 2. COPTIS.
    - Petals none; sepals white (rarely pinkish or bluish).
      - Leaves simple, round-reniform. . . . . 3. CALTHA.
      - Leaves compound. . . . . 4. ISOPYRUM.
  - Flowers many, in racemes, white. . . . . 5. ACTAEA.
- Petals 5, prolonged backward into hollow spurs. . . . . 6. AQUILEGIA.

Flowers irregular, complete, with spurs; sepals 5.
- Upper sepal spurred. . . . . 7. DELPHINIUM.
- Upper sepal helmet-like. . . . . 8. ACONITUM.

B. Ovary usually with one ovule; fruit an achene.

Leaves alternate or basal; flowers perfect (except in most Thalictra).
- Petals none.
  - Cauline leaves in a single involucral whorl of 3; flowers mostly large. . . . . 9. ANEMONE.
  - Cauline leaves alternate; flowers inconspicuous.
    - Leaves simple; flowers perfect. . . . . 10. TRAUTVETTERIA.
    - Leaves compound; flowers commonly dioecious. . . . . 11. THALICTRUM.
- Petals present.
  - Sepals spurred; achenes on a slender spike-like receptacle; diminutive herbs. . . 12. MYOSURUS.
  - Sepals not spurred; achenes crowded on a convex receptacle so as to appear capitate.
    - Petals with a nectar-pit on claw; sepals greenish or yellowish.
      - Flowers yellow or white; achene with a close coat. . . 13. RANUNCULUS.
      - Flowers pink; achene utricular. . . . . 14. BECKWITHIA.
    - Petals reduced to a minute stiped nectary; sepals white, corolla-like. . . . . 15. KUMLIENIA.

Leaves opposite; flowers polygamous; achenes with a feathery tail; woody climber. . . . . 16. CLEMATIS.

1. **PAEÒNIA** L.

Perennial herbs with ternately divided leaves. Flowers large, solitary and terminal. Calyx herbaceous, persistent. Sepals and petals 5 or 6, the latter and the numerous stamens borne on a fleshy disk adnate to the base of the calyx. Style short or none. Follicles 2 to 5, thick and leathery, several-seeded. (Paion, the physician of the gods.)

1. **P. brównii** Dougl. Western Peony. Somewhat fleshy plants 8 to 14 in. high; leaves glaucous or pale, ternately or biternately divided, chiefly basal, the lobes obovate to linear-spatulate; peduncles 1 to 2 in. long; flowers ¾ to 1½ in. broad; petals orbicular, plane, brownish red, thick and leathery, scarcely longer than the roundish concave sepals; follicles mostly 5, broadly oblong, smooth, 1 to 1½ in. long; stems several, bending over in age and the pods resting on the ground.—Brushy hillslopes, 600 to 5400 ft.: coastal S. Cal. and n. to San Luis Obispo Co.; Mendocino Co. to Siskiyou Co.; Sierra Nevada from Tuolumne Co. to Plumas and Modoc Cos.; n. to Wash., e. to Utah.

2. **CÓPTIS** Salisb. Goldthread

Low perennial herbs with slender rootstocks. Leaves basal, divided or compound. Stems scapose, bearing 1 to 3 white flowers. Sepals 5 to 7, petal-like. Petals 5 to 7, small, linear, hooded above. Stamens 10 to 25. Pistils 10 to 12, stipitate, in fruit forming an umbel of follicles. (Greek koptein, to cut, referring to the divided leaves.)

1. **C. láciniàta** Gray. Scapes 2 or 3-flowered, 4 to 6 in. high; leaves trifoliolate, each leaflet deeply 3 to 5-cleft or divided, or more or less completely replaced by 3 separate leaflets; leaflets ovate, serrate or incised, ¾ to 2 in. long; sepals slender, 4 to 5 lines long, the slender petals a third shorter; follicles 4 to 6 lines long, exceeding the stipes.—Woods near the coast from Mendocino Co. to Del Norte Co.; n. to Wash.

3. **CÁLTHA** L. Marsh Marigold

Perennial herbs, ours with round-cordate basal leaves and 1 to 2-flowered scapes. Rootstock short, vertical, bearing a fascicle of strong fibrous roots. Sepals 5 to 9 (in ours) white or bluish on back, showy. Petals none. Stamens numerous. Pistils 5 to 10 (or to 24), bearing ovules in 2 rows along the ventral suture, in fruit becoming follicles. (Ancient Latin name of the Marigold.)

1. **C. biflòra** DC. Scapes 1 or 2, erect, 2 to 10 in. high, exceeding the leaves; leaves crenate or nearly entire, 1 to 3 in. broad, broader than long, the basal lobes overlapping, or their inner tips turned inward and upward: sepals 6 to 9, oblong, 5 to 7 lines long; stamens about 130; follicles stipitate. —Subalpine, 6100 to 10,500 ft., in marshy slopes or wet meadows: Sierra Nevada from Tulare Co. to Plumas Co.; n. Humboldt Co. to w. Siskiyou Co.; n. to Alas.

4. **ISOPÝRUM** L.

Low glabrous slender perennials with (in ours) a cluster of fusiform tubers or thickened fibres. Leaves twice ternately compound, the leaflets 2 to 3-lobed, petiolulate. Flowers commonly white, solitary, terminal or axillary. Sepals 5, petal-like. Petals (in ours) none. Stamens 10 to 30. Follicles 5 to 11, oblong or ovate, 2 to several-seeded. (Isopyron, the Greek name of a species of Fumaria.)

Stamens about 23 to 27; peduncles surpassing the leaves.....1. *I. occidentale.*
Stamens about 10; peduncles not surpassing the leaves.....2. *I. stipitatum.*

1. **I. occidentàle** H. & A. Plant of delicate habit; stems from a cluster of slender fusiform roots, branching above, 4 to 10 in. high; leaflets obovate or fan-shaped, 5 to 9 lines long, glaucous beneath; flowers commonly white, rarely pink, 6 to 9 lines broad; filaments slender; follicles 5 to 7, sessile, 4 to 6 lines long; seeds 8 or 9, wrinkled.—Shady places in the hills or lower mts., 300 to 2000 ft.; widely distributed in the Coast Ranges and Sierra Nevada but very local: Gabilan Peak; Mt. Hamilton; Vaca Mts.; Amador Co.; Kinsley, Mariposa Co.; Girard, Kern Co. Apr. (Enemion occidentale Drum. & Hutch.)

2. **I. stipitàtum** Gray. Fig. 375. Tufted plant 1 to 3 in. high, the stems from a cluster of numerous fusiform tubers; leaves glaucous, the leaflets or divisions oblong-oblanceolate or oblongish, 2 to 4 lines long; flowers

375. Isopyrum stipitatum Gray; *a*, habit x ¾; *b*, fl. x 2; *c*, pistil x 4.

whitish, 3 to 4 lines broad; filaments enlarged in the middle; follicles 6 to 11, 2½ to 3 lines long; seeds 3 to 5.—Brushy or wooded hillslopes, 2400 to 4500 ft.: Mt. Hamilton Range; Mendocino Co. to Siskiyou Co., thence e. to Modoc Co.

5. ACTAÈA L. Baneberry

Perennial herbs with bi- or tri-ternately compound ample leaves. Stems tall, arising from short branching rootstocks and bearing 1 or 2 leaves. Flowers small, white, in a short terminal raceme. Sepals about 4, petal-like, roundish or obovate, concave, caducous. Petals 1 to 10, small, entire, or none. Stamens many, with small anthers and slender white filaments, longer and more showy than the petals or sepals. Pistil 1; ovules 10 in 2 rows; stigma broad, sessile, obscurely 2-lobed. Fruit a berry, somewhat poisonous. (Latin name of the Elder, transferred by Linnaeus to these plants.)

1. A. spicàta L. var. argùta Torr. Fig. 376. Stems one to several, 1½ to 3 ft. high, arising from the scaly terminal buds of the rootstock; leaves all cauline, none basal, ½ to 2 ft. long; leaflets broadly to narrowly ovate, rather deeply incised and sharply serrate, 1 to 2½ in. long; petioles rather short; racemes terminal, ¾ to 1 in. long, or with 1 or 2 small lateral racemes in the axils of the upper leaves; sepals 1¾ lines long, their tips often pinkish; petals none, or 1 to 7 (or 9) and white, oval to rhombic-spatulate, slender-clawed; stamens 11 to 35, 2 to 3 lines long; berries ellipsoid or subglobose, red or white, with polished surface, 3 to 5 lines long.—Wooded or brushy hills, mostly north slopes: Coast Ranges (mostly near the coast, commonly 100 to 2000 ft., from Santa Lucia Mts. to Siskiyou Co.); or in the higher mts., 4000 to 8200 ft. (San Bernardino Mts.; Sierra Nevada from Tulare Co. n. to Modoc Co.); n. to Alas., e. to Rocky Mts.

376. Actaea spicata var. arguta Torr.; *a*, fr. branch x ½; *b*, fl. x 2.

6. AQUILÈGIA L. Columbine

Perennial herbs with ternately compound chiefly basal leaves, petiolulate leaflets and showy solitary flowers. Sepals 5, plane, colored like the petals. Petals 5, all alike and produced backward into large hollow spurs projecting below the calyx. Stamens numerous, some sterile inner ones with dilated filaments, appearing like scarious scales. Pistils 5, becoming several-seeded follicles. (Derivation doubtful, said by some to be from the Latin aquila, an eagle, on account of the claw-like spurs.)

Flowers pendulous.
Blade of petals nearly obsolete.
Throat of petal spurs truncate, about 2 lines in diameter.....1. *A. truncata.*
Throat of petal spurs cut backward, about 4 lines in diameter.....2. *A. tracyi.*
Blade of petals 3 to 5 lines long.....3. *A. formosa.*
Flowers erect or soon becoming so.....4. *A. pubescens.*

1. **A. truncàta** F. & M. Stems several, erect, branching, 1½ to 3½ ft. high; herbage glabrous; leaves biternate, the leaflets ¾ to 1¾ in. long, broad or roundish in outline, 3-cleft or -divided, or incised, crenately toothed; flowers scarlet, tinged with yellow, pendulous in anthesis, the spurs, therefore, erect, 8 to 9 lines long, truncate at the orifice, the blade almost none; sepals widely spreading, 9 to 11 lines long; follicles 8 to 10 lines long, conspicuously veined, the long styles persistent.—Moist shaded places in the lower hills, or at middle altitudes in the mts., almost throughout Cal. May-July. Var. PAUCIFLÒRA Jepson. A more compact plant; leaves mostly basal, these and the nearly naked stems forming a dense heavy tuft; stems 1 to 1½ ft. high, few-flowered.—High montane in the Sierra Nevada.

2. **A. trâcyi** Jepson. Similar to the preceding; herbage puberulent and viscid throughout, especially on the stems; upper leaves reduced to small bracts; flowers larger and stamens longer; sepals reflexed; petal spurs usually spreading more widely, the throat nearly twice the diameter of the throat in no. 1, and with its orifice cut backward obliquely and not horizontally; styles very long.—Rocky places along streams: Mt. Diablo; Marin Co. to Napa and Mendocino Cos. A glabrous form is found in the Santa Cruz Mts. Rare. June-Sept.

3. **A. formòsa** Fisch. Stems 1½ to 3 ft. high; flowers crimson to scarlet; sepals 8 to 10 lines long; petal blades yellow, truncate, about ⅛ to ½ the length of the crimson spurs which nearly or quite equal the spreading sepals; follicles 10 to 14 lines long.—Higher mts., Butte Co. to Siskiyou Co.; n. to Alas., e. to Utah.

4. **A. pubéscens** Cov. Stems 9 to 18 in. high; leaves minutely soft-pubescent or quite glabrous; leaflets small (4 to 6 lines long), cleft and crenate at apex; flowers erect, cream yellow, varying occasionally to white or to shades of red, pink or purple; sepals oblong-ovate to ovate, 7 to 11 lines long, 4 to 5 lines broad; petal-blades obtuse, 4 to 5 lines long, their spurs 11 to 13 lines long.—Alpine, in rocky places, 9000 to 12,000 ft.: Sierra Nevada from Mariposa Co. to Tulare Co.

7. DELPHÍNIUM L. LARKSPUR

Herbs, ours perennial, with palmately divided leaves. Flowers in terminal racemes. Sepals 5, irregular, the upper one produced into a spur at the base. Petals 4, in unequal pairs, with small spreading usually oblique blade on a claw of about equal length, the upper developed backward into nectary-bearing spurs, which are concealed within the spur of the calyx. Pistils (in ours) 3, seldom more, becoming many-seeded follicles. (Greek delphinion, larkspur, derived from delphin, the flowers of some species resembling the classical figures of the dolphin.)

A. Flowers red; follicles glabrous; seeds sharply angled, narrowly margined. —Sect. PHOENICODELPHIS.

Leaves divided into narrowly linear or lanceolate divisions; stem leafy....1. *D. cardinale.*
Leaves parted into broad mostly obtuse divisions.
Stem few-leaved; common.....2. *D. nudicaule.*
Stem leafy; rare.....3. *D. purpusii.*

B. Flowers blue, white, pink or lavender.—Sect. DELPHINASTRUM.

1. Root a globose tuber or a cluster of fleshy roots.

Leaves mostly twice palmately divided or cleft and toothed.
Follicles erect, glabrous; foothills and middle altitudes.....4. *D. decorum.*
Follicles strongly curved-diverging, pubescent; n. Mendocino to Siskiyou and Modoc; higher altitudes.....5. *D. menziesii.*
Leaves commonly pedately divided into very narrow, mostly entire, lobes; n. Sierra Nevada at higher altitudes.....6. *D. pauciflorum.*

2. Root a cluster of hard woody, often fusiform, fibres.

Leaves not fan-shaped; stems freely or sparsely leafy, at least with a few leaves towards the base; upper petals usually white, the lower simulating the color of the calyx.
Stems very tall; flowers numerous; pedicels spreading, the racemes loose or, at least, broad; follicles glabrous.
Ultimate leaf-lobes little unequal, obtuse, mucronulate; raceme mostly loose; herbage glabrous; far North Coast Ranges.....7. *D. trolliifolium.*
Ultimate leaf-segments unequal, lanceolate or acute.
Flowers slightly puberulent; herbage glabrous; Sierra Nevada.....
8. *D. scopulorum.*
Flowers rather densely pubescent; herbage pubescent; coast species.....
9. *D. californicum.*
Stems tall; racemes commonly very strict or cylindric, sometimes loose; follicles puberulent.
Seeds densely covered with thin processes, as if scaly-echinate; Sierra Nevada, lower altitudes.....10. *D. hansenii.*
Seeds not scaly-echinate.
Coastal or interior valley species.
Petioles hirsute with spreading hairs, mostly short; racemes of medium length and often loose; flowers commonly royal purple, rarely pinkish; mostly central Coast Ranges.....11. *D. variegatum.*
Petioles finely canescent.
Sepals densely pubescent on the back (usually blurring the color) in a median longitudinal band; pedicels mostly 2 to 6 lines long; leaf-lobes mostly short; petioles mostly short; west-central Cal. chiefly.....12. *D. hesperium.*
Sepals lightly pubescent on the back (not blurring the color); pedicels mostly 4 to 12 lines long; leaf-lobes usually long; petioles often long; S. Cal. chiefly.....13. *D. parryi.*
Desert or transmontane species; leaves thickish; stems and petioles glabrous or nearly so.
Flowers a light but lively blue; leaves glabrous; Death Valley region, and Mohave and western Colorado deserts....14. *D. parishii.*
Flowers deep-blue; leaves sparingly pubescent; chiefly east side of n. Sierra Nevada.....15. *D. andersonii.*
Leaves cuneately fan-shaped; stems scape-like; inner North Coast Ranges.....
16. *D. uliginosum.*

1. **D. cardinàle** Hook. SCARLET LARKSPUR. Stem stout, 3 to 6 ft. high, leafy; leaves 3 to 9 in. broad, divided into 5 to 7 narrowly linear or lanceolate divisions, the divisions usually again lobed or parted; racemes ½ to 1½ ft. long; pedicels of about the same length as the flowers; calyx bright scarlet; sepals 6 to 9 lines long, exceeded by the spur; petals mostly yellow, the upper unequally 2-lobed, one lobe truncate, the other very much longer, emarginate, and hairy at tip on inside; lower pair of petals with ovate blade commonly notched at apex, short-hairy on inside.—Among shrubs or bushes, mesas, foothills or washes, 500 to 1500 ft.: coastal S. Cal., e. to San Felipe Creek, s. to L. Cal.

2. **D. nudicáule** T. & G. RED LARKSPUR. Stems slender, 1 to 2 ft. high, few-leaved or quite naked; herbage glabrous or nearly so; leaves somewhat succulent, 3 to 5-parted into broad mostly obtuse divisions, the divisions cleft, lobed or entire; racemes 2 to 12-flowered, loose and open; pedicels 1 to 3½ in. long, the lower often much longer than the upper; calyx red, glabrous or very sparsely puberulent; sepals 4 to 6 lines long, the spur nearly one-half longer; petals partly or mostly yellow, the upper narrowly obovate, sharply notched at summit, much larger than the small cleft lower ones; follicles glabrous, divergent-curving.—Banks of rivulets and rocky summits: Coast Ranges, 800 to 3000 ft., from Santa Lucia Mts. to Siskiyou Co.; Sierra Nevada, 4000 to 8000 ft., from Mariposa Co. to Modoc Co.; s. Ore. Var. LÚTEUM Jepson n. comb. Leaves sparsely short-hairy; flowers larger, pale yellow, pubescent; spur broader.—Marin and Sonoma coasts. (D. luteum Hel.)

3. **D. purpùsii** Bdg. Stems 1½ to 3 ft. high; stems and petioles slightly pubescent, the leaves a little ciliate; leaves 2 to 3 in. broad, 3-cleft into very broad toothed or incised lobes; racemes sparsely flowered, 4 to 8 in. long; flowers purplish red or dull pink, disposed to dry lavender; sepals about 4 lines long, much shorter than the thickish spur; follicles 7 to 10 lines long.—Rocky slopes, Greenhorn Range.

4. **D. decòrum** F. & M. Stem lax, 1 to 1¼ (or 2) ft. high; herbage glabrous, or sometimes slightly pubescent, especially the petioles and pedicels;

basal leaves thick, often somewhat succulent, roundish in outline, 1 to 2½ in. broad, mostly shallowly 3 to 5-parted into broadly cuneate or roundish segments; segments entire, or 3-cleft or -lobed, the lobes obtuse, mucronate; upper leaves pedately 3 to 5 or rarely 7-parted into linear-oblong lobes; racemes mostly many-flowered, 2 to 4 (or 11) in. long; pedicels slender, spreading, ½ to 1 or 2 in. long; flowers purple-violet, glabrous or nearly so; sepals oval, 5 to 8 lines long, equaled or excelled by the spur; mature follicles thickish, oblong, glabrous, 5 to 6 lines long, erect or the tips spreading; seeds sinuous-roughened with short scales.—Open woods in the foothills of the Coast Ranges and Sierra Nevada; s. to the San Gabriel, San Bernardino, San Jacinto and Cuyamaca mountains. Var. PÀTENS Gray. Pedicels glabrous or sparsely glandular-pubescent; racemes mostly strict; flowers smaller (sepals 4 to 5 lines long), deep blue, magenta, pink or lavender-white; follicles diverging from below the middle.—Open places in woods: Sierra Nevada, 3000 to 8300 ft., from Calaveras Co. to Tulare Co.

5. **D. menzièsii** DC. Stem arising from a cluster of connected roundish or cylindric tubers, 6 to 11 in. high, slender, often flexuous, usually branching at the base, the branches often strongly divergent; herbage quite glabrous, or sometimes pubescent; leaves twice palmately divided and cleft into linear or oblong, mostly obtusish, lobes; racemes 2½ to 6 in. long, mostly few (2 to several)-flowered; pedicels spreading, ½ to 1 in. long, the lower usually elongated, 1 to 1½ in. long; flowers blue, sparingly pubescent, with short scattered hairs; sepals 4 to 8 lines long, ¾ to as long as the slender spur; follicles hirsutulose or nearly glabrous, 7 to 9 lines long, curving and strongly divergent from very base at maturity, rarely suberect; seeds narrowly subconic, rotately cellular-margined at the truncate end, and a little at the pointed end, rarely on the sides.—Northern Mendocino Co. to Siskiyou Co., 1000 to 6500 ft.; n. to B. C. and Mont.

6. **D. pauciflòrum** Nutt. Stems low (5 to 15 in. high), slender, mostly simple, few-leaved, arising from a fascicle of oblong or fusiform tubers; leaves pedately divided into nearly distinct segments; segments linear or lanceolate (sometimes oblong), entire or some of them 1 or 2-toothed, 6 to 12 lines long; racemes few, 2 to 8 (rarely more)-flowered; pedicels spreading, 4 to 12 lines long; flowers blue to pink purplish; sepals 4 to 6 lines long, much shorter than the slender spur; follicles pubescent, short-oblong (4 to 6 lines long), more or less spreading at tip in age; seeds margined on the quadrate summit but not on the angles.—Montane, 5000 to 9100 ft.: Sierra Nevada from Mariposa Co. n. to Siskiyou Co.; n. to Wash., e. to Col.

7. **D. trólliifòlium** Gray. Cow Poison. Stems coarse, 4 to 6 ft. high; herbage glabrous; leaves thinnish, 2½ to 5 in. broad, orbicular in outline, 5 to 7-cleft into cuneate segments, the segments incised or with rounded teeth, the upper leaves with acute teeth or segments; racemes very loose below, sometimes dense above, ¾ to 1 or 2 ft. long; pedicels widely spreading, 1 to 1¾ in. long, or the lowermost 3 to 5 in. long, hairy or glabrous; bractlets narrowly lanceolate, 2 to 4 lines long; flowers deep blue; sepals 4 to 5 lines long, the very slender spur nearly half again as long; follicles glabrous, 9 to 12 lines long, only slightly spreading, or sometimes strongly recurved-spreading.—Moist ground on edges of woods near the coast: Humboldt Co.; n. to Ore.

8. **D. scopulòrum** Gray var. **gláucum** Gray. Stems tall (2½ to 6 ft. high), very leafy; herbage glabrous, sometimes glaucous; leaves 4 to 6 in. broad, deeply 5 to 7-parted into cuneate divisions; divisions incised and cleft, the central lanceolate segments of each division prominent and salient; racemes 1 to 1½ ft. long; pedicels 5 to 7 (or 12) lines long, ascending; bractlets filiform, 4 to 6 lines long; flowers blue or purplish, puberulent, numerous in racemes 1 to 1½ ft. long; sepals 5 to 6 lines long, the spur about as long; lower petals cleft to the middle; follicles 5 to 6 lines long, glabrous.—High montane, 6000 to 8000 ft.: South Fork Santa Ana River, San Bernardino Mts.; Sierra Nevada from Mariposa Co. to Nevada Co.; n. to Alas. (D. glaucum Wats.) Var. LUPÒRUM Jepson. Leaves smaller (1¼ to 2¼ in.

broad), very light green, the segments of the divisions more nearly equal; flowers comparatively few (5 to 13), in a rather loose raceme; calyx lightly villous-pubescent.—High s. Sierra Nevada (Inyo, Fresno and Tulare Cos.), 10,000 ft.

9. **D. californicum** T. & G. Coast Larkspur. Stems stout, 2½ to 7 ft. high, sparsely pubescent, many-leaved; leaves very large, 4 to 6 in. broad, 2 to 4 in. long, deeply parted into 3 to 5 deeply incised segments; sinuses of the primary divisions mostly closed in the lower leaves, open in the upper; racemes very dense, ¾ to 1½ ft. long; pedicels 4 to 7 lines long, or the lowest somewhat more; bractlets very long and slender (4 to 8 lines long); flowers rather densely pilose-pubescent, white or whitish, or somewhat purplish inside, never fully expanded; sepals 3 to 4 lines long, commonly shorter than the spur; follicles oblong, turgid, 4 to 5 lines long, hardly, if at all, diverging; seeds black, wrinkled.—Low hills near the coast: San Luis Obispo Co. to Marin Co.; also higher north slopes of inner Coast Range peaks (Mt. Diablo; Cedar Mt.).

10. **D. hansènii** Greene. Hansen Larkspur. Stems slender or sometimes very coarse, commonly simple, 1¼ to 4 ft. high; leaves twice or thrice palmately divided into narrow or oblong lobes; petioles hispid-hirsute; flowers pale blue to pink, lavender or white, essentially as in D. hesperium but usually smaller; raceme narrow, mostly dense, 1½ to 8 in. long; pedicels 2 to 4 lines long, or the lower sometimes 1 to 1½ in. long; seeds densely covered with minute scale-like processes.—Sierra Nevada foothills, 500 to 2500 ft., from Butte Co. to Tulare Co. Var. arcuàtum Greene. Racemes more elongated (½ to 1¼ ft. long), looser; spur strongly curved or straight.—Higher foothills 2500 to 4000 ft., from Calaveras Co. to Kern Co.

11. **D. vàriegàtum** T. & G. Royal Larkspur. Stems erect, simple or branching above, ¾ to 1½ ft. high; herbage hispidulous with spreading hairs, especially at base; leaves regularly twice or thrice parted or divided, the segments oblong, mostly obtusish (or those of the upper leaves acute), mucronulate, usually diverging; raceme few (about 1 to 10)-flowered, loose, the pedicels ½ to 1½ in. long, or the lower ones sometimes much elongated; flowers royal purple, rarely whitish lavender; sepals 7 to 12 lines long; spur stoutish, as long as the sepals, the tip often slightly curved; lower petals large, elliptic or roundish, commonly colored like the sepals; upper petals obliquely oblong, whitish; follicles oblong, rather turgid, 7 to 10 lines long, hispid-pubescent; angles of the seeds narrowly winged, the wings soft-cellular, commonly sordid.—Open grassy hills, commonly gregarious in small colonies. Coast Ranges near the coast from Mendocino Co. to San Luis Obispo Co. Var. apiculàtum Greene. Flowers usually on shorter pedicels in a cylindrical raceme.—Inner foothills from Butte, Tehama and Napa Cos. to Santa Clara Co.

12. **D. hespèrium** Gray. Western Larkspur. Stem commonly simple, 1½ to 3 ft. high, arising from a cluster of thick-fibrous roots or a single woody taproot; herbage shortly pubescent; leaves 2 to 3 times palmately cleft into oblong or linear spreading segments; raceme rather dense, virgate, 6 to 14 in. long; pedicels 2 to 6 lines long, or the lowest 1 in., strictly erect; flowers commonly blue, rarely pink or white or intermediate shades; sepals 4 to 6 lines long, equaled or exceeded by the straight spur, somewhat densely puberulent on the outside or the alternate ones with a rather definite puberulent band; petals little shorter than the sepals; follicles short-oblong, 3 to 5 (or 7) lines long, pubescent; seeds with a loose cellular whitish coat, which is produced into narrow wings on the angles.—Dry open ground in the foothills: Coast Ranges (Humboldt Co. to Contra Costa Co. and Monterey Co.). Flowering at beginning of the dry season; rather common, but occurring as scattered individuals, rarely in colonies. Var. recurvàtum Davis. Habit of the species; leaves usually with narrower more acute divisions; flowers pink-lavender or lavender-white, rarely blue; sepals recurving.—Low, especially alkaline lands, Sacramento and San Joaquin valleys, and saline valleys of the inner South Coast Ranges. Var. cuyamàcae Jepson. Leaves thick-

ish or subcoriaceous, the sinuses with straight rather than curving sides, the lobes broad and mainly cleft at apex; raceme dense (like San Joaquin Co. specimens of var. recurvatum) or loose; flowers blue, like those of the species.—Cuyamaca Mts. Perhaps also on Mt. Pinos. Var. SÈDITIÒSUM Jepson. Leaves mostly basal, minutely pubescent or canescent, the segments filiform or narrowly linear, more or less revolute.—Monterey Co. towards the coast.

13. **D. párryi** Gray. Stems commonly simple, 1 to 2¾ ft. high, arising from a short caudex crowning several woody-fibrous roots; herbage minutely puberulent; leaves twice divided and redivided into narrowly linear lobes, the lobes usually elongated, acute, ½ to 2½ in. long, and often arcuate-contorted; upper leaves often pedately 5-divided into filiform lobes; racemes virgate, often cylindric, sometimes loose, strict, 4 to 14 in. long; pedicels mostly 4 to 12 lines long or the lower longer; flowers blue or light purplish, rarely white-flowered; sepals 6 to 8 lines long, equaling the spur, 1½ to 2 times as long as the petals; follicles puberulent, 5 to 6 lines long; seeds with a loosely cellular whitish margin to the angles.—Sandy or loam soil, open ground: coastal S. Cal., e. to edge of Colorado Desert, n. to San Carlos Range and s. Sierra Nevada (Tulare Co.). The blades of the lower leaves are inclined to disjoint roughly in age, leaving the rigid petioles behind. Var. BLÓCHMANAE Jepson. Leaf-lobes narrowly linear (½ to ¾ line wide); flowers large, in a dense short raceme (2½ to 4 in. long), the light blue sepals in pleasing contrast to the white petals; sepals 8 to 11 lines long, with crisped edges; seed unknown.—Near the coast, San Luis Obispo Co. Var. MARÍTIMUM Dav. Commonly branching; leaf-lobes mostly 1 to 3 lines broad, often falcately curving; raceme loose, commonly elongated (4 to 15 in. long), the pedicels 1 to 2 in. long; flowers large, the sepals 6 to 11 lines long; angles of the seed not winged.—Coast region, San Luis Obispo to Los Angeles Co. and San Diego.

14. **D. paríshii** Gray. Stems stout or somewhat slender, 1½ to 2 ft. high, one or several from the crown of a stout root, which forks into several deep-seated branches; herbage wholly glabrous or commonly so; leaves ¾ to 1½ (or 2) in. broad, the basal cut into broadish segments which are again cleft or toothed, the basal similar but often more narrowly divided; raceme virgate, many-flowered, 5 to 7 in. long; pedicels 4 to 8 lines long; flowers a light but lively sky-blue; sepals 3 to 5 lines long, the petals ⅔ as long; follicles obscurely puberulent, sometimes a little distended at the middle, 5 to 6 lines long; seeds as in D. hesperium.—Sandy washes or mesas, 500 to 7500 ft.: Mohave Desert, s. to Palm Sprs., n. to Inyo Co. Var. INOPÌNUM Jepson. Stems 3 ft. tall, the stems and leaves quite glabrous; sepals very narrow (suboblong), glabrous; flowers pale lavender; follicles glabrous.—Kern River Cañon, 7800 ft.

15. **D. andersònii** Gray. Stems several from the base, 1½ to 2 ft. high; herbage more or less glaucous, glabrous or nearly so, the blades lightly pilose; leaves thickish, 1 to 2½ in. broad, deeply and incisely 2 to 3 times parted into oblong or linear segments, the teeth of the lower leaves mostly obtuse, sometimes acute; raceme rather loose, 7 to 10 in. long; pedicels ½ to 1 (or 1½) in. long; flowers blue; sepals 5 to 6 lines long, mostly longer than the stout spur, which is shortly curved at the blunt tip; follicles glabrous, 5 to 7 lines long.—Adobe soil: e. side of northern Sierra Nevada; w. Nev.

16. **D. ùliginòsum** Curran. Stems erect, nearly naked, 1 to 2 ft. high, glabrous or sparingly hispidulose; leaves glabrous, cuneately fan-shaped, 1 to 3 in. long (on petioles as long or longer), the earliest merely cleft or toothed at apex, the later incisely parted; racemes strict, the pedicels subequal; flowers blue or occasionally pink; sepals 3 to 6 lines long, the spur as long or longer; petals deeply notched, ciliate, and with a tuft of hairs on the upper side; follicles slender, puberulent, 4 to 6 lines long; seeds densely covered with minute blunt processes, some short, some longer and branched.—Moist gravelly stream beds or water-trickles on rocky slopes: Howell Mt.; Knoxville Ridge, Napa Co.; Indian Valley, ne. Lake Co.; w. Colusa Co.

8. **ACONÌTUM** L. Aconite

Tall perennial herbs with palmately lobed leaves. Flowers showy, irregular. Sepals 5, the upper one larger and hooded or helmet-like. Upper petals 2, reduced to slender claws terminating in a nectary and covered by the helmet-like sepal, the 3 lower ones minute rudiments or wanting. Stamens numerous. Pistils 3 to 5, many-ovuled, becoming follicles in fruit. (Ancient Greek name.)

1. **A. columbiànum** Nutt. Western Monkshood. Stems 1½ to 3 ft. high, arising from thick roots; leaves roundish in outline, 2 to 3 in. broad, parted or divided into 5 cuneate toothed or incised lobes; raceme loose, sometimes paniculate, viscid-pubescent; flowers blue, rarely white; hooded sepal 6 to 7 lines long.—Wet meadows and streamlet borders, 4000 to 8000 ft.: Sierra Nevada from Tulare Co. n. to Modoc Co., thence w. to Salmon Mts.; e. to Ariz., n. to B. C.

9. **ANEMÒNE** L. Wind-flower

Perennial herbs, the stems and basal leaves from a rootstock. Stem leaves none except an involucral whorl of 3 near to or distant from the solitary or umbellate flowers. Sepals 5 to 8, petal-like, imbricate. Petals none. Stamens numerous. Achenes numerous, the style short or developing into a long plumose tail. Seed suspended. (Greek anemos, wind, the flowers disturbed by the wind.)

Leaves 2 to 3 times finely dissected into small segments; stems from the crown of a thick root.
- Styles densely hairy, becoming plumose tails in fruit.....1. *A. occidentalis.*
- Styles not hairy.
  - Sepals elliptic or oval, 7 to 10 lines long; stems from the crown of a taproot....2. *A. baldensis.*
  - Sepals oblong, 4 lines long; stems from a tuber.....3. *A. tuberosa.*

Leaves 3-foliolate, not dissected; stems from horizontal rootstocks.
- Involucral leaves sessile; rootstocks filiform.....4. *A. deltoidea.*
- Involucral leaves petioled; rootstocks thickened.....5. *A. quinquefolia.*

A. Styles densely soft-hairy; achenes with long plumose tails.—Subgenus Pulsatilla.

1. **A. occidentàlis** Wats. Stems from the crown of a thick vertical root, 4 to 15 in. high, 1-flowered; stems, petioles and midribs woolly-pubescent, mostly glabrate, except at base of bracts and of stems; leaves divided into 5 petioled divisions, the divisions 2 or 3 times divided and cleft; involucral leaves sessile by a broad base, similar to the basal leaves; sepals 5 (or 6), white "or purplish," oval or broadly oblong, 1 in. long; achenes pubescent, their tails ¾ to 1 in. long, at length recurved, forming a globose head 1½ to 2 in. in diameter; receptacle minutely velvety.—Alpine, 6000 to 10,000 ft.: Sierra Nevada from Tulare Co. to Plumas Co.; nw. to Mt. Shasta and to w. Siskiyou Co.; n. to B. C.

B. Styles glabrous or nearly so; achenes with glabrous or pubescent tails.—Subgenus Euanemone.

2. **A. baldénsis** L. Stems 1 to several, 4 to 15 in. high, arising from the branching crown of a thick taproot, 1-flowered; herbage glabrate (sometimes silky when young); leaves 3 times dissected into linear or oblong acute lobes, the lobes 2 to 6 lines long; flowers white or "bluish," 1 to 1¾ in. broad; sepals 5 or 6 to 8, elliptic or oval; ovary hairy; style almost capillary, glabrous or nearly so.—Mt. slopes, 5000 to 7000 ft.: Sierra Nevada from Nevada Co. to Plumas Co.; Salmon Mts.; Marble Mt.

3. **A. tuberòsa** Rydb. Stems 4 to 10 in. high, from a tuberous root, 1 or rarely 2-flowered; leaves 3-foliolate, glabrate, the divisions ternately cleft and toothed; flowers white or purplish, 7 to 9 lines broad; sepals 8 to 10, linear-oblong; style filiform, straight, nearly as long as the ovary; achenes densely woolly.—Panamint Mts.; Providence Mts. (P. A. Munz); Ariz. to Utah.

4. **A. deltoidea** Hook. Stems 3 to 12 in. high; rootstocks filiform or whip-like, several in. long; basal leaves and involucral leaves 3-foliolate; leaflets

broadly ovate or rhombic, crenately toothed above the entire base, some sparingly incised, 1 to 3 in. long; sepals commonly 5, white, 6 to 11 lines long; achenes hirsute-pubescent, with straight style.—Woods, 600 to 5500 ft.: Humboldt Co. to Siskiyou Co.; n. to Wash. May-July.

5. **A. quinquefòlia** L. var. **gràyi** (Greene) Jepson. WOOD ANEMONE. Stems slender, 1-flowered, 4 to 12 in. high, from a thickish rootstock; basal leaf simple, of reniform outline, trifid; involucral leaves 3-foliolate, petioled, the leaflets obovate, entire at base, crenately toothed or incised above, the lateral usually oblique, ½ to 1½ in. long; flowers white or pale blue, 6 to 8 lines broad; sepals 5 (or 6); achenes puberulent, with short recurved style.—Shady woods in mts., mostly near the coast, 200 to 5000 ft.: Santa Cruz Co. to Siskiyou Co. Mar.-June.

10. TRÁUTVETTÈRIA F. & M.

Perennial herbs. Leaves alternate, simple, palmately cleft, mostly basal. Stems branching at summit and bearing loose corymbose cymes of white flowers. Sepals 3 to 5, broad, white, petal-like, caducous. Petals none. Stamens numerous, filaments clavate, white, conspicuous. Achene utricular, capitate on the short receptacle. (E. R. Trautvetter, Russian botanist, 19th century.)

1. **T. grándis** Nutt. Stems 1½ to 3 ft. high; leaves deeply about 5-cleft, 2½ to 8 in. broad, unequally serrate, the basal long-, the cauline short-petioled; flowers 6 to 8 lines broad; sepals oval or roundish, concave, 2 lines long; achenes glabrous.—Mountain woods, Plumas Co. to Siskiyou Co.; n. to B. C.

11. THALÍCTRUM L. MEADOW RUE

Perennial herbs with mostly tall erect stems from a short rootstock. Leaves bi- or tri-ternately compound, with petiolulate (or some sessile) leaflets. Flowers many, small (1½ to 3 lines long), panicled, rarely in a raceme, dioecious, or sometimes perfect. Sepals 4 (or 5 to 7), greenish, or more or less petal-like. Petals none. Stamens numerous with long mucronate anthers on capillary filaments. Achenes 4 to 15, veined or furrowed, sometimes inflated, tipped with the persistent long styles. (Greek thallo, to grow green, the application uncertain.)

Flowers in a simple raceme, perfect, nodding; alpine or subalpine dwarf...1. *T. alpinum.*
Flowers in a panicle; tall plants, mostly of the foothills and middle altitudes.
  Flowers perfect; achenes stiped.....2. *T. sparsiflorum.*
  Flowers dioecious; achenes not stiped or scarcely so.
    Achenes broad, strongly oblique both ventrally and dorsally; common.
      Sides of achene 3 or 4-ribbed.....3. *T. fendleri.*
      Sides of achene with branching nerves, at most 1-ribbed...4. *T. polycarpum.*
    Achenes narrow, scarcely oblique; rare.....5. *T. occidentale.*

1. **T. alpìnum** L. Stems 3 to 6 in. high; leaves basal, short-petioled, 1 to 1½ in. long, ternate, the lateral divisions with 3, the terminal with 5 leaflets; leaflets notched, 3-cleft or -divided, 1½ to 2 lines long; flowers in a simple raceme, perfect, purplish, nodding; achenes slightly flattened, sessile, 4 or 5-ribbed on the sides, 1 to 1¼ lines long.—White Mts.; Nev. to Col., n. to the Arctic. Circumpolar. It is probable that this species once occupied most of the northern hemisphere south of the great glaciers (John Lubbock).

2. **T. sparsiflòrum** Turcz. Stems erect, slender, 2 to 2½ ft. high; flowers perfect, few in a narrow panicle; leaflets small (6 to 10 lines long); ovaries densely and minutely glandular; achenes very minutely glandular-dotted, shortly stiped, 2½ lines long, 1¼ to 1½ lines wide, strongly oblique (half-obovate), with the dorsal angle straight, the sides with 3 or 4 veins curving upward and inward from the base and more or less branching above.—High mts., 5000 to 9500 ft.: San Bernardino Mts. and Sierra Nevada; e. to the Rocky Mts., n. to Alas.; Asia.

3. **T. féndleri** Engelm. Stems 2 to 3 ft. high; herbage glabrous; leaflets roundish, 5 to 8 lines long, incised or crenate, the teeth mostly rounded but apiculate; panicle 3 to 6 in. long or with accessory panicles from the upper

axils; sepals mostly white-scarious, elliptic to ovate, mostly obtuse; achenes 2 to 3 lines long, 1 to 2 lines broad, irregularly oval in outline, more oblique ventrally, the sides 3 or 4-nerved or -ribbed, the central nerve most prominent, the lateral often branched, or merely with irregular branching nerves on the sides.—Montane, 2000 to 8500 ft.: Sierra Nevada from Nevada Co. to Tulare Co.; mts. of S. Cal.; e. to N. Mex. Var. HESPÈRIUM Jepson. Inflorescence and achenes very sparsely glandular-puberulent; achenes flattened.—Sierra Nevada, about 7000 ft.

4. **T. polycárpum** Wats. Stems 2 to 3 (or 6) ft. high; herbage glabrous throughout; leaflets rather prominently veined beneath; sepals elliptic to ovate, mostly acute; achenes many, somewhat inflated, the sides marked with anastomosing veins and mostly with a salient rib down the middle.—Mostly foothills or lower altitudes of the mts.: S. Cal.; Coast Ranges; n. to Ore. Var. CAÈSIUM Jepson. Glaucous throughout; achenes less turgid, the sides simple with anastomosing veins.—Cent. and n. Sierra Nevada foothills and lower altitudes of the mts.

5. **T. occidentàle** Gray. Leaflets 1 to 2 in. long; achenes few, lanceolate or oblong-lanceolate, acuminate, scarcely oblique, 3 to 4 lines long, ¾ to 1 line wide, the sides with 3 prominent ribs or nerves.—Moist shady places, Plumas Co. to Siskiyou Co.; n. to B. C., thence e. to the Atlantic. Rare with us.

12. MYOSÙRUS L.

Dwarf annuals with entire tufted basal leaves and naked 1-flowered scapes. Flowers whitish or yellowish, small (1½ to 2 lines broad). Sepals 5, spurred at base. Petals 5, with a nectar-bearing hollow at the summit of the slender claw. Stamens 5 to 20. Achenes numerous, crowded on a long and slender spike-like receptacle. Ovules attached near the summit of the cell. (Greek mus, a mouse, and oura, a tail, in allusion to the curious receptacles.)

Flowers raised on scapes; achenes with an appressed beak.
Back of achene narrow, its keel ending in a straight or spreading subulate beak.... 1. *M. aristatus.*
Back of achene rhomboidal, flattish, its low keel ending in a short or nearly obsolete beak.... 2. *M. minimus.*
Flowers sessile in a close cluster on the ground, or shortly scapose; achenes with a spreading beak.... 3. *M. alopecuroides.*

1. **M. aristàtus** Benth. Scapes several, ¾ to 1¾ in. high; leaves mostly shorter than the scapes; petals present or wanting; spike-like receptacles 2 to 4 lines long; achenes thin-walled, the narrow back continued into a subulate straightish or spreading beak.—San Jacinto Mts.; San Bernardino Mts.; Sierra Valley; n. to B. C., e. to the Rocky Mts. Var. LEPTÙRUS Jepson. More slender, 1 to 3 in. high; carpels beakless or very short-pointed; carpel-spike 3 to 8 lines long.—Livermore and Sacramento valleys.

2. **M. mínimus** L. MOUSE TAIL. Scapes 2 to 6 in. high, the slender spike-like receptacles ½ to 1¾, commonly about 1 in. long; leaves linear-filiform, 1 to 2 in. long; mature achenes with somewhat rhomboidal back and very low keel ending in a straight appressed or rarely obsolete tip.—Low ground: inner Coast Ranges; Sacramento and San Joaquin valleys; n. to Ore., e. to Ill. and Fla. Back of achene broader than in no. 1. Var. ÀPUS Greene. Spike-like receptacles nearly or quite sessile in a cluster amongst and shorter than the leaves.—Lower San Joaquin Valley; San Diego Co.; L. Cal. Var. FILIFÓRMIS Greene. Scapes 1 to 6 in. high; receptacles not tapering, very slender, almost thread-like.—San Francisco and Antioch.

3. **M. alòpecùroides** Greene. Leaves 1 line wide, ½ to 2½ in. long; spike-like receptacle slender-conical, rather thick, 3 or 6 to 10 lines long, sessile or very shortly scapose, in clusters of about 4 to 9; achenes not flattened on the back, thin-walled and with prominent spreading beak.—Shallow vernal pools of alkaline flats: w. side of the lower Sacramento and lower San Joaquin valleys. Mar.-Apr.

13. RANÚNCULUS L. Buttercup. Crowfoot

Annual or perennial herbs with divided or entire leaves. Flowers solitary or somewhat corymbed, yellow, or less commonly white, rarely pink. Sepals 5, rarely 4 or 3. Petals 5 (rarely 1 or 3) to 16, with a little nectar-bearing pit at base, the pit commonly covered by a scale. Stamens usually numerous. Achenes numerous, in a globular or oblong cluster. Seed attached near the base of the cell. (Latin name for a little frog, some species growing in wet places where frogs are found.)

A. Nectar-bearing pit on petal claws covered with a scale.

1. Achenes with a firm close coat, not loose or utricular.—Subgenus Euranunculus.

Aquatic; perennials.
Leaves finely dissected....1. *R. delphinifolius.*
Leaves cordate, entire....2. *R. hydrocharoides.*
Terrestrial plants, often in muddy or marshy places, but not truly aquatic or floating.
Achenes not spiny-muricate, nor with hooked hairs.
Leaves simple, entire; achenes thickish.
Perennials; petals 5, medium to showy; achenes not papillate.
Stems erect or ascending from a cluster of fibrous roots, not rooting at the nodes.
Leaves glabrous or slightly hairy; stems mostly leafy; achenes turgid, glabrous....3. *R. alismaefolius.*
Leaves mostly densely pilose; stems naked or nearly so; achenes turgid, pubescent....4. *R. lemmonii.*
Stems filiform, creeping or decumbent, rooting at the nodes.... 5. *R. flammula.*
Annuals; basal leaves ovate; petals 1 to 3, minute; achenes papillate.... 6. *R. pusillus.*
Leaves (or some of them) toothed, lobed or divided.
Herbage glabrous or nearly so; achenes thick or plump.
Perennials; low plants; alpine or northern.
Basal leaves nearly or quite as broad as long, rounded or truncate at base, 3-lobed at apex or entire.7. *R. glaberrimus.*
Basal leaves broader than long, subcordate, 3 (or 5) -parted and coarsely toothed....8. *R. eschscholtzii.*
Annuals; stems fistulous....9. *R. sceleratus.*
Herbage pubescent or hirsute; leaves lobed or divided, mostly compound; perennials.
Beak of the achenes commonly curved, much shorter than the body, rarely as long.
Stems commonly rather coarse, mostly erect and rather tall; achenes strongly flattened.
Corolla pale or whitish, very small; beak of achene like a grab-hook....10. *R. bongardii.*
Corolla golden, showy; sepals reflexed.
Beak deltoid, slightly curved at the acute tip; petals 5 to 10....11. *R. canus.*
Beak narrowly or broadly subulate, not deltoid.
Petals 9 to 16; beak very short, stoutish, rather closely recurved....12. *R. californicus.*
Petals 5 or 6; beak rather slender, falcate-curved but more or less erect.13. *R. occidentalis.*
Stems creeping or reclining; achenes roundish or turgid, the beak curved or, if straight, at least hooked at tip; sepals not reflexed.
Corolla showy; achene margined; beak somewhat recurved... 14. *R. repens.*
Corolla small; achene not margined; beak nearly straight.... 15. *R. macounii.*
Beak of the achenes straight, as long as the body; sepals reflexed; stems spreading or ascending.
Leaflets toothed or laciniate.
Petals 5, emarginate; leaflets crenate, mostly not lobed..... 16. *R. bloomeri.*
Petals 5 to 8, rounded at apex; leaflets deeply 3-cleft or laciniate....17. *R. orthorhynchus.*
Leaflets or their divisions with entire margins, not serrate or laciniate....18. *R. marmorarius.*
Achenes prickly or with stiffish hooked hairs; annuals.
Flowers minute; achenes with hooked hairs; delicate plant...19. *R. hebecarpus.*
Flowers medium; achenes spiny-muricate, with raised border.
Leaves cleft into 3 to 5 lobes, the lobes toothed; border of achene beveled, not spiny....20. *R. muricatus.*
Leaves deeply 2 or 3 times divided; border of achene spiny..21. *R. arvensis.*

2. Achenes with a thin coat; perennials.

Leaves cordate, lightly crenate; flowers yellow; achenes thin-walled, striate; receptacle elongated-oblong; stems creeping.—Subgenus Halodes.....22. *R. cymbalaria.*

B. Nectar-bearing pit on petal claws naked; leaves or some of them filiform-dissected; flowers white; aquatic.—Subgenus BATRACHIUM.

Leaves immersed, all filiform-dissected, or rarely some floating leaves 3-parted into broad rounded lobes ..... 23. *R. aquatilis.*
Leaves floating, with 3 broad divergent narrowly ovate lobes, or some submersed leaves capillary-dissected ..... 24. *R. lobbii.*

1. **R. delphinifòlius** Torr. YELLOW WATER CROWFOOT. Aquatic perennial; stems fistulous, 1 to 2 ft. long; leaves three or four times ternately dissected into linear-filiform acuminate segments; flowers golden-yellow, showy (8 to 13 lines broad), on naked fistulous peduncles ¾ to 2¼ in. long; petals 5 or 6, broadly obovate; scale of the nectary pit prolonged upwards into narrow or broad wings attached by one edge to the petal and often with free tips, the whole structure conspicuous, ¼ to ⅓ as long as the petal, but apparently variable in form and size; achenes turgid, callous-margined at base and ventrally with a tumid ridge, ¾ line long, the subulate beak over half as long.—Stagnant ponds or pools or slow-flowing streams: Humboldt Co.; Modoc Co.; n. to B. C., e. to the Atlantic; Siberia. Rarely collected in Cal.

2. **R. hydrocharoides** Gray. Aquatic perennial; stems rather slender, sparingly branched above, 3 to 8 in. high from a coarse but short vertical rootstock, which also produces creeping stems; leaves mostly basal, these long-petioled, simple, ovate to cordate, entire, undulate and somewhat callous-margined, 5 to 12 lines long, a little succulent; flowers 2½ to 3½ lines broad; upper leaves obovate or spatulate; achenes ¾ line long.—Marshes and springs: Owens Valley; Ariz. to Mex. Aspect suggestive of a small Sagittaria.

3. **R. alismaefòlius** Geyer. Stems stout, somewhat fistulous, erect, sparingly branched above, several-flowered, 8 to 18 in. high, arising from a short perennial rootstock bearing thick-fibrous roots; herbage glabrous, rarely a little hairy; leaves oblong-lanceolate or lanceolate, 2½ to 6 in. long, mostly 5 to 8 (or 12) lines broad, tapering to apex, and at base usually tapering gradually into the petiole, the basal and lower leaves long-petioled, the upper shortly petioled or sessile, entire or commonly a few on a plant obscurely serrulate; flowers 8 to 10 lines broad; petals 5, roundish obovate; achenes smooth, glabrous, turgid, 1 line long, with a short-subulate introrse beak.—Swamps in Mendocino and Humboldt Cos.; n. to B. C. and Ida. Var. HARTWÉGII Jepson. Stems slender, not fistulous, ascending, 3 to 13 in. high, usually a little leafy, simple or sparingly branched, but umbellately 3-flowered at summit; stems and petioles hairy or glabrous; leaves lanceolate or oblong-lanceolate, 1 to 4 in. long, tapering gradually into the petiole or the uppermost sessile or nearly so; petioles about half as long as the blade, rarely longer; flowers 5 to 8 lines broad; achenes with short-filiform or slender beak.—Higher altitudes (4500 to 9000 ft.): Sierra Nevada from Tuolumne Co. to Siskiyou Co., thence to n. Trinity Co. This variety passes into var. alismellus, although the two in their extreme forms are quite different. Var. ALISMÉLLUS Gray. Fig. 377. Leaves thin, mostly or usually wholly basal, these and the stems in dense tufts; stems 2 to 10 in. high, commonly simple and 1-flowered, naked or 1 or 2-leaved; herbage glabrous, sometimes slightly hairy at base; leaves ovate to oblong-lanceolate, 4 to 12 lines long, on petioles as long or longer, the few stem leaves nearly sessile; flowers 3 to 6 lines broad.—Alpine or subalpine wet meadows or shallow streamlets, 7000 to 10,500

377. Ranunculus alismaefolius var. alismellus Gray; plant x ½.

Jepson, Manual, pp. 129-384, Dec. 6, 1923.

378. Ranunculus flammula var. reptans E. Mey.; *a*, habit x ⅔; *b*, fl. x 1¼; *c*, achene x 4.

ft., often filling gravelly meadows with golden bloom: Sierra Nevada; far North Coast Ranges; high mts. of S. Cal. July.

4. **R. lemmònii** Gray. Perennial; stems scape-like, 4 to 7 in. high, these and the leaves from a small short or globose rootstock bearing numerous stoutish fibres; scapes glabrous, simple or 3-branched near the ground or midway, with a pair of opposite bracts or leaves below the middle; leaves lanceolate, pilose, 1½ to 3½ in. long, drawn down to petioles as long or nearly (and strongly dilated at base); flowers 6 to 9 lines broad, solitary on the scape or its scape-like branches; petals 5, rarely 6 or 7, obovate or oblong; achenes in a globose head, very turgid, minutely pubescent, the beak very short.—Dry plains or valleys in the mts., e. slope of the Sierra Nevada in Sierra and Nevada Cos., 5000 ft. May. Very nearly related to R. alismaefolius var. hartwegii.

5. **R. flámmula** L. var. **réptans** E. Mey. CREEPING SPEARWORT. Fig. 378. Perennial; stems slender or almost filiform, decumbent or creeping, rooting at the nodes, 3 to 13 in. long; leaves lanceolate, linear- or oblong-lanceolate or oblong-ovate, entire, ½ to 1¾ in. long, tapering into petioles ½ to 2½ in. long, or sometimes sessile; flowers 2 to 5 lines broad, terminating leafy stems or naked scape-like peduncles 1 to 2 in. high; petals 5 (or to 8); achenes comparatively few, thick, less than ½ to 1 line long, the beak short.—Margins of lakes or shallow slow meadow-streamlets: San Bernardino Mts.; Sierra Nevada at middle altitudes; North Coast Ranges; n. to Alas., e. to N. Eng. July.

6. **R. pusíllus** Poir. DWARF SPEARWORT. Slender annual 3 to 11 in. high; herbage glabrous or the dilated petiole somewhat sparingly villous-ciliate; basal leaves round-ovate to ovate, toothed or entire, 3 to 8 lines long, on elongated petioles; cauline leaves elliptic-oblong to linear-lanceolate, entire or slightly denticulate, ¾ to 2 in. long, more shortly petioled; flowers minute; sepals subscarious, mostly not reflexed; petals commonly 1 to 3, ¾ line long; achenes numerous in a small globose head, papillate, ½ line long, the beak very minute.—Low wet ground or in shallow pools, North Coast Ranges (Marin Co. to Humboldt Co.); e. U. S. Apr.-May.

7. **R. glabérrimus** Hook. SAGEBRUSH BUTTERCUP. Fig. 379. Perennial; stems 2 to 7 in. high, 1 to 3-flowered, these and the basal leaves from a cluster of slender-fusiform roots; herbage glabrous, somewhat succulent; basal leaves roundish to oval, obtuse or truncate at base, 3-lobed at apex, or entire, ½ to 1¼ in. long, on petioles 3 to 4 times as long; cauline leaves

379. Ranunculus glaberrimus Hook.; *a*, plant x ⅔; *b*, achene x 6.

380. Ranunculus eschscholtzii Schlecht.; *a*, plant x 1; *b*, achene x 6.

few, 3-lobed or 3-parted, short-petioled or subsessile; flowers golden-yellow, sometimes aging white, ¾ to 1¼ in. broad; achenes plump, with roundish back, ¾ line long, the short beak slender-subulate, straight.—Sandy and gravelly sagebrush flats, plains and mt. slopes: Lassen, Modoc and Siskiyou Cos.; n. to B. C., e. to Col. This species flowers rather close to the ground, the stems and petioles elongating markedly after anthesis (Mary H. Manning.)

8. **R. eschschòltzii** Schlecht. Fig. 380. Perennial; stems and leaves in a dense tuft on a very short vertical rootstock; stems erect, 4 to 6 (2½ to 10) in. high; herbage glabrous, the calyx slightly hairy; basal leaves 6 to 15 lines broad, broader than long but roundish or reniform in outline, subcordate at base, unequally 3-cleft or -parted, the smaller central lobe obovate, entire, or 3-toothed, the lateral mostly 3-cleft, rarely all the lobes alike, but all the apices acute; petioles 1 to 2 in. long; cauline leaves few, similar or pedately 3-cleft, short-petioled; peduncles terminal, naked, ½ to 1 (or 2½) in. long; flowers golden-yellow (often aging dull white), 4 to 9 lines broad; petals round-obovate; achenes thickened, glabrous, smooth, somewhat carinate on the back, the beak short, recurved; receptacle oblong, 4 to 5 lines long.—Subalpine, in gravelly or rocky surface streamlets on cool mountain slopes, 9000 to 13,700 ft.: Sierra Nevada from Nevada Co. to Tulare Co.; White Mts.; San Bernardino and San Jacinto mountains; w. Nev.; n. to Alas. The thicker-leaved form of the central Sierra Nevada is var. OXYNÒTUS Jepson (R. oxynotus Gray.)

9. **R. sceleràtus** L. CURSED CROWFOOT. Annual; stems erect, somewhat fistulous, branching, leafy, 7 to 12 in. high, from a cluster of stout fibrous roots; herbage glabrous or nearly so, somewhat succulent; leaves ¾ to 1½ in. broad, parted into 3 (or 5) cuneate segments which are again cleft and coarsely toothed, the ultimate lobes or divisions short-oblong, obtuse; basal leaves long-petioled; uppermost leaves nearly sessile, the segments broadly linear and nearly entire; flowers 3 to 5 lines broad; petals pale yellow, scarcely exceeding the calyx; receptacle elliptic or oblong, 1½ to 4 lines long; achenes thick, ½ line long, the beak almost none.—Shallow pools or muddy margins of lakes, Modoc Co.; n. to B. C., s. to Ariz., e. to N. B. Juice acrid, raising blisters on the skin.

10. **R. bongàrdii** Greene. Perennial; stems slender, or often coarse, 1 to 2 ft. high; herbage sparsely or densely pilose below, above pubescent or hirsutulose; leaves 3-parted, the divisions shallowly 3-cleft or disposed to be quite entire, rather broad and elongated, especially the upper; flowers small (2 to 3 lines broad), very pale yellow or whitish; achenes elliptic, glabrous, the very slender beak as long as the body, erect-curved like a grab-hook.—Shady woods: Humboldt Co. and n. Sierra Nevada; n. to Alas. Var. GRÈENEI Piper. Achenes hispidulose.—San Bernardino Mts.; Pine Ridge, Fresno Co.; Humboldt Co.

11. **R. cànus** Benth. Perennial; stems erect, branching, 1 to 1¾ ft. high; herbage fragrant (at least at certain stations, probably not always), soft-villous all over when young or the leaves beneath conspicuously silky-lanate; leaves mostly in a basal tuft, deeply parted and subdivided into many lanceolate acute segments, long-petioled; flowers 6 to 12 lines broad; petals 5 to 8 (or 10); achenes large, flat, glabrous, 2 to 3 lines long, including the rather conspicuous triangular-subulate beak which is slightly curved at the tip.—Plains or low rolling hills: Sacramento Valley; e. Contra Costa Co. It passes into R. californicus.

12. **R. californicus** Benth. CALIFORNIA BUTTERCUP. Fig. 381. Stems mostly caespitose, arising from a cluster of stout fibrous perennial roots, erect or ascending, 9 to 18 in. high, freely branching and many-flowered; herbage hirsute (especially below) to nearly glabrous, the leaves often silky beneath; leaves ovate or roundish in outline, 1 to 2 (or 3) in. long, ternately divided, and again divided, parted or lobed, the earlier with the broad divisions shallowly and mostly obtusely lobed, the later with the laciniately and sharply cleft divisions less broad or narrowly linear; flowers 6 to 11 lines broad; sepals usually somewhat petal-like, closely reflexed; petals 9 to 16, uncommonly as few as 7 or 8, obovate to oblong; achenes glabrous, strongly flattened, nearly as broad as long, ¾ to 1½ lines long, very rounded dorsally, the ventral side straightish; beak very short, mostly stoutish and closely recurved, sometimes slender and slightly recurving.—Open hills and moist

381. Ranunculus californicus Benth.; *a*, fl. branch x 1; *b*, usual type of leaf x 1; *c*, lower leaf x 1; *d*, petal x 3; *e*, achene x 4½; *f*, seedling x 1; *g*, *h*, later leaves of seedling x 1.

valleys, our most common species, abundant in the Coast Ranges and s. to S. Cal. Also occurring in the Great Valley and neighboring foothills but localized or less common. Var. CUNEÀTUS Greene. Stems prostrate or decumbent; leaves thin; the lower leaves sharply cleft into 3 broad lobes, the divisions incised but more equally toothed than in the species, so that the outline is roundish-subcordate.—San Mateo to San Francisco and Marin Co.; often on ocean bluffs. Var. CRASSIFÒLIUS Greene. Stout, low, the stems assurgent; herbage somewhat succulent, sparingly villous; basal leaves shallowly 3-lobed, the lobes rounded and more or less coarsely toothed; cauline leaves parted into 3 oblong lobes.—Coast bluffs, Mendocino Co. to San Francisco. Var. LUDOVICIÀNUS (Greene) Davis. Stems many, coarse, rather densely tufted; herbage rather densely pilose or even silky, especially below;

leaves cut into rather broad acuminate or lanceolate segments; flowers and achenes of the species.—Mt. mdws., 4500 to 7000 ft., Tehachapi Mts. to the San Bernardino Mts. and San Diego Co.

13. **R. occidentàlis** Nutt. Perennial; habit of R. californicus; herbage pilose or hirsute below with spreading hairs, often densely so on the petioles, or varying to nearly glabrous; basal leaves of roundish outline, ¾ to 2 in. broad, incisely 3 (or 5)-cleft or -parted, rarely divided into separate leaflets, the segments mostly broad, shallowly but incisely lobed and toothed; upper cauline leaves divided into linear segments; flower 6 to 10 lines broad; petals 5; achenes flattened, obliquely rounded dorsally, nearly straight on the ventral side, 1 to 2 lines long, the subulate beak saliently erect, straight or somewhat falcate, and commonly projecting somewhat forward rather than recurving, ⅓ to ⅔ as long as the body.—Placer and Mendocino Cos. n. to Siskiyou Co.; far n. to Wash. There are intergrades to the varieties. Var. EISÈNII Gray. Stems slender, erect, 1 to 1½ ft. high; stems and leaves pilose with spreading hairs or only the leaves pilose, or the herbage subglabrous; leaves lobed as in the species; flowers 5 to 8 lines broad; petals commonly 5, sometimes 6, rarely 7; beak of the achenes slender, curving, rarely closely recurved.—Openly wooded ridges, flats or valleys: middle and inner Coast Ranges from Santa Clara Co. to Siskiyou Co., 500 to 2500 ft.; Sierra Nevada foothills from Tulare Co. to Shasta Co., 2500 to 4500 ft. This is the most common buttercup throughout most of its range. Var. RATTÁNII Gray. Stems slender, 1 to 2 ft. high; pubescence as in var. eisenii; petals 5 or 6; achenes hispidulose, the beak slender, nearly erect or projecting forward a little, or recurved.—Mendocino and Humboldt Cos.; n. to southern Ore., ranges s. to Napa Co. in a modified form. Var. ÀLCEUS Jepson. Plants diffuse, 6 to 9 (or 15) in. high; stems and petioles very pilose below; flowers small; achenes as in var. eisenii.—North Coast Ranges and Sierra Nevada, (3000 or) 5000 to 7500 ft.; a late flowering rather small plant about intermediate between the species and var. eisenii.

382. Ranunculus repens L.; *a*, fl. branchlet and basal leaf x ½; *b*, head of achenes x ½; *c*, achene x 2.

14. **R. rèpens** L. CREEPING CROWFOOT. Fig. 382. Perennial; stems trailing, arising from a cluster of stout fibrous roots, ½ to 1 ft. long, rooting at the lower nodes; herbage sparsely bristly, often densely so on the petioles; leaves 1 to 4 in. broad, the basal long-petioled, composed of 3 distinct or nearly distinct leaflets; leaflets incisely 3-parted and again incisely cleft or toothed; flowers 6 to 12 lines broad; sepals not reflexed; petals much longer than the sepals, brilliant gold; achenes flattened, keel-margined all around, 1 line long, bearing a short stout somewhat curved beak which is bent or hooked at tip.—Native of Eur., sparingly naturalized in marshes: Marin Co.; Humboldt Co.

R. BULBÒSUS L. Stem erect, from a bulb-like base; herbage hairy; basal

383. Ranunculus bloomeri Wats.; *a*, fl. branchlet x ⅔; *b*, basal leaf x ⅔; *c*, achene x 3.

leaves 3-parted; peduncles furrowed. — An escape at Fortuna, Humboldt Co. (acc. J. P. Tracy); native of Eur.

15. **R. macoùnii** Britt. Perennial; stems stoutish, trailing or reclining, rarely rooting at the nodes, 1 to 1½ ft. long; general aspect similar to R. orthorhynchus; stems and petioles hispidly hirsute with spreading hairs; leaves 3-foliolate, incisely 3-cleft, with laciniate and sharply toothed segments; flowers relatively insignificant (4 to 5 lines broad); petals little surpassing the early deciduous sepals; heads of achenes large, dense, globular or somewhat oval; achenes somewhat flattened, carinate-margined all around, 1 to 1½ lines long, with a short-lanceolate straightish beak ½ line long.—Nev. to Ore. and B. C., entering Cal. in Modoc Co.; e. to the Atlantic.

16. **R. bloòmeri** Wats. Fig. 383. Stems erect or ascending, 5 to 18 in. high, from a cluster of thick-fibrous or even slender-fusiform perennial roots; herbage somewhat succulent, glabrous or a little hairy, especially on the leaf bases; basal leaves 3 foliolate (or a few simple), on petioles 6 to 14 in. long; leaflets (as well as the simple blades) ovate to roundish, obtuse to cordate at base, coarsely dentate, sparsely incised, or 3-lobed, usually petiolulate, ¾ to 2 in. long; flowers few and large, 1 to 1½ in. broad; petals 5, emarginate at apex, the greenish area at base conspicuous and the nectar-gland large; achenes turgid, 1½ lines long, tipped with a slender subulate beak as long.—Low fields near the coast from San Mateo Co. to Contra Costa and Mendocino Cos. Feb.-Apr.

17. **R. órthorhýnchus** Hook. Fig. 384. Stems leafy, ascending or erect, ¾ to 1½ ft. high, these and the basal leaves from a large cluster of stout-fibrous or slender-fusiform perennial roots; petioles and stems hirsute or villous with spreading hairs; leaves pinnately 5-foliolate, the 3 upper leaflets often approximate; leaflets incisely cleft or toothed, or 3-parted, especially the terminal one, ¾ to 1½ in. long; flowers yellow, 6 to 9 lines broad; petals 5; achene glabrous, thickish, 2 lines long, with a broad ventral channel and weak dorsal keel, the subulate upright beak quite as long as the body.—Wet meadows, middle altitudes (3600 to 5600 ft.) in the Sierra Nevada from Mariposa Co. to Modoc Co. and Siskiyou Co.; n. to B. C. Var. HÁLLII Jepson. Leaflets of basal leaves broader than long, with mostly shallow lobes and obtuse teeth (suggestive of Apium graveolens); achenes rather sharply margined, the margins running onto the stout beak as salient ridges.—Pine

384. Ranunculus orthorhynchus Hook.; *a*, habit x ⅔; *b*, leaf x ⅔; *c*, achene x 3.

385. Ranunculus hebecarpus H. & A.; *a*, fr. branch x 1; *b*, achene x 4½.

Ridge, Fresno Co. Var. PLATYPHÝLLUS Gray. Stems very stout, (½ or) 1½ to 3½ ft. high, from a cluster of slender fusiform roots; herbage brownish-hirsute or pilose, the hairs often retrorse and often dense on the petioles, or nearly glabrous throughout; leaves 3-foliolate or the leaflets replaced by 3 leaflets; lateral leaflets sessile or short-petiolulate, the terminal one long-petiolulate; flowers ¾ to 1¼ in. broad; petals 5 to 8, round-obovate to broadly oblong, deep rich glistening yellow; achenes margined.—Swamps and ditches: North Coast Ranges, mostly near the coast; n. to Wash. Mar.-May.

18. **R. marmorárius** Jepson & Tracy. Stems ascending, 6 to 10 in. high, from perennial roots; herbage sparsely hirsute; basal leaves 3-foliolate, the leaflets cuneate-obovate, 3-cleft into narrow lobes, otherwise entire; cauline leaves deeply 3-parted, or 3-foliolate with lanceolate entire petiolulate leaflets, or simple and lanceolate; achenes with very slender beak as long as or longer than the body.—Marble Mt., w. Siskiyou Co.

19. **R. hebecárpus** H. & A. Fig. 385. Slender delicate annual herb, 5 to 12 in. high, branching, sparsely villous; leaves thin, round or reniform in outline, 3-parted or -divided, the divisions somewhat divergent, entire, notched or lobed, or the uppermost divided into 3 narrowly oblong acute segments; peduncles 3 to 9 lines long; flowers minute, pale yellow; petals early deciduous, commonly before the stamens; achenes few, hispidulous with hooked hairs, orbicular, flat, 1 line long, tipped with a short curved beak.—Common in the foothills and sometimes in the valleys, in the shade of oak and other trees: frequent in the Coast Ranges; Sacramento Valley; Sierra Nevada; S. Cal. near the coast; s. to L. Cal., n. to Wash.

386. R. muricatus L.; achene x 3.

20. **R. muricátus** L. Fig. 386. Annual; stems stout, 3 to 10 in. high; herbage yellowish green, somewhat succulent, glabrous; leaves roundish or reniform, ¾ to 2 in. broad, coarsely toothed and commonly 3-cleft; flowers 3 to 7 lines broad; petals 5 (or 3); achenes 4 lines long, including the stout ensiform beak, the sides very flat, surrounded by a conspicuous raised smooth border and coarsely muricate or prickly.—Low places in valley fields: nat. from Eur., widely scattered in cent. and n. Cal., but not common.

387. Ranunculus cymbalaria Pursh.; *a*, plant x ½; *b*, stolon rooting at tip; *c*, achene x 4½.

21. **R. arvénsis** L. HUNGER-WEED. Erect annual, 1 to 1½ ft. high; lower leaves with three broad coarsely crenate lobes, the upper 2 or 3 times divided into narrow acute segments; achenes spiny-tuberculate on the raised margin as well as on the sides.—Mariposa Co.; introd. from Eur.

22. **R. cymbalària** Pursh. DESERT CROWFOOT. Fig. 387. Perennial by whip-like or thread-like stolons which root at intervals of 1½ to 2½ in. and produce tufts

of leaves and scapes; scapes 1¼ to 8 in. high, 1 to 3-flowered; leaves round-ovate to reniform, cordate at base, remotely notched, 4 to 10 lines long, on petioles 2 to 3 times as long; flowers 4 to 6 lines broad; petals 5 to 9 (or 12), oblong, shorter than or little exceeding the sepals; receptacle oblong-conic, obtuse, 2 to 6 lines high; achenes with striate sides.—Moist alkaline soils in river bottoms or desert lake beds or about desert springs: upper San Joaquin Valley; cismontane S. Cal.; Mohave Desert; thence n. along the e. side of the Sierra Nevada through Inyo and Lassen Cos. to Modoc Co. Widely distributed in N. and S. Am. and Asia. May-July.

23. **R. aquátilis** L. WATER BUTTERCUP. Perennial submersed aquatic, only the tips of the slender stems and the flowers resting on the surface of the water; leaves all many times dissected into filiform or capillary divisions, rarely some floating leaves with 3 broad lobes 2 or 3-toothed at apex; flowers 3 to 5 (or 8) lines broad; sepals deciduous; styles subulate, rarely persisting; receptacle often hairy; achenes transversely rugose, commonly hispidulous, about 11 to 18 in a rather compact round head.—Ponds, vernal pools, and slow streams in the valleys and mts.: Coast Ranges; Sierra Nevada; S. Cal. It is variable, and being rather common and nearly cosmopolitan, a large number of forms have received specific names. Apr. Var. TRICHOPHÝLLUS Gray. Green Eel-grass. Leaves rather short and rigid, not collapsing on withdrawal from the water.—Widely distributed. Var. BÀKERI Jepson. Leaves small, sparsely branched, the rigid segments divaricate.—Santa Clara Co. Var. PEDUNCULÀRIS Jepson. Peduncles very stout, falcate-curved, 1 in. long.—Lake Co. Var. HISPÍDULUS Drew. Lower base of the emersed leaves, and the petioles and stipules hispid.—Humboldt Co.

24. **R. lóbbii** Gray. LOBB'S BUTTERCUP. Annual; submersed leaves none, or when present, few and as in R. aquatilis; floating leaves 6 to 9 lines broad, divergently 3-parted into oblong or ovate lobes, the lateral lobes notched and the middle one commonly entire, or, rarely, all notched; stamens 5 to 10; petals withering persistent; style filiform, about 3 times the length of the ovary; achenes few (4 to 6), rugose, the mature ones commonly with minute black dots.—Whitening the surface of shallow vernal pools: Alameda and Marin Cos. to Napa Valley and n. Sonoma Co.; n. to B. C.

14. **BECKWÍTHIA** Jepson.

Perennial herb with the dissected leaves and 1-flowered scapes from a stoutish rootstock. Petals rose-color or pink, roundish, with short narrow claw and a pocket-like pit near the base of the blade. Sepals and petals withering-persistent. Achenes strongly utricular. (Lieut. E. G. Beckwith, leader of a Pacific Railroad survey through the northern Sierra Nevada.)

1. **B. andersònii** (Gray) Jepson. Scapes naked, 4 to 9 in. high; herbage glabrous; leaves of rounded outline, palmately twice or thrice dissected into oblong or linear segments; segments acute, 2 to 4 lines long; flowers 12 to 14 lines broad; sepals round-ovate, purplish-margined; achenes numerous, 3 to 4 lines long, the beak very short.—Modoc and Mono Cos.: Ore. to Ariz. (Ranunculus andersonii Gray.)

15. **KUMLIÈNIA** Greene

Glabrous perennial with the leaves and 1-flowered scapes from a fascicle of thickened or fleshy-fibrous roots. Leaves all basal, roundish, shallowly 3-lobed and sparingly toothed, cordate or truncate at base. Sepals 5 or 6, white. Petals 5 or 6, minute, reduced to small yellow stiped nectaries. Achenes sub-follicular, capitate, membranous, lanceolate, attenuate upward into a broadly subulate beak hooked or coiled at the tip, 2 (or 3)-nerved on the sides, at least when dead ripe. Seed fusiform, longitudinally multi-striate. (T. L. Kumlien, one-time Professor of Natural History at Albion College.)

1. **K. hystrícula** (Gray) Greene. Fig. 388. Scapes 2 to 9 in. high; leaves roundish in outline but broader than long, ½ to 2½ in. broad, on petioles

¾ to 2 in. long; flowers 5 to 7 (or 12) lines broad; sepals oval; nectaries spoon-shaped, one line long; achenes weakly pubescent, 2 to 2½ lines long; seed ¾ line long.—Clefts of rocks on moist cañon sides, often within reach of flying spray: Sierra Nevada at middle altitudes (1500 to 5000 ft.), from Tulare Co. to Butte Co.; n. to Ore. Jan.-June.

16. CLÉMATIS L. Virgin's Bower

Stems woody below, climbing by aid of the petioles of the opposite compound leaves. Peduncles axillary, bearing 1 to numerous flowers. Flowers (in ours) polygamous. Sepals 4, valvate in the bud, white and petal-like. Petals none (in ours). Stamens numerous. Achenes numerous in a head-like cluster, the styles persistent as hairy or plumose tails, very conspicuous in fruit. (Ancient name, from Greek klema, a twig.)

388. Kumlienia hystricula Greene; *a*, plant x ½; *b*, fl. x 1; *c*, achene x 4½.

Peduncle bearing a cymose panicle of many flowers, the cymes leafy-bracteate; leaflets 5 to 7; achenes pubescent.....1. *C. ligusticifolia.*
Peduncle 1 to 3-flowered, with 2 bractlets below the middle.
Leaflets 3; achenes pubescent.....2. *C. lasiantha.*
Leaflets mostly 5 to 9; achenes glabrous.....3. *C. pauciflora.*

1. **C. ligústicifòlia** Nutt. Yerba de Chivato. Nearly glabrous, except the inflorescence; leaflets 5 to 7, ovate, cordate or obtuse at base, 3-lobed or coarsely toothed about midway, or nearly entire, mostly 1 to 3 in. long; peduncles 1 to 4 in. long, bearing a panicle of many to numerous flowers; flowers ½ to ¾ in. in diameter; sepals narrowly oblong, acute, tomentulose; tails of the achenes 10 to 13 lines long; fruiting panicles corymbose to long-paniculate, 2 to 15 in. long.—Valleys, foothills and mts., 100 to 3500 ft.: S. Cal.; Sierra Nevada; Coast Ranges; n. to Ore. It climbs high over shrubs and sometimes ascends trees. An infusion of the herbage is used by Spanish-Californians as a healing wash for cuts in horses.

2. **C. lasiántha** Nutt. Pipe-Stem. Branchlets and sepals tomentose-pubescent, the foliage less so; leaves trifoliolate, the leaflets elliptic to orbicular, truncate or rounded at base, coarsely toothed and often 3-lobed, 1 to 2 in. long; peduncles 1 (rarely 3)-flowered, 2 to 6 in. long; flowers 1¼ to 2¼ in. in diameter; sepals broadly oblong, usually obtuse; achenes supporting a tail 1 to 1½ in. long, the fruit of one flower forming a head-like cluster 2 to 2½ in. broad.—Cañons and hillsides, 100 to 2000 ft.: Coast Ranges; Sierra Nevada; mts. of S. Cal. It clambers over shrubs or low trees, often illuminating a hillside with its profusion of flowers; occasional along streams in the valleys. Apr.-May.

3. **C. pauciflòra** Nutt. Rope Vine. Stems slender; herbage silky-pubescent when young; leaves more or less fascicled, 3 to 5-foliolate or the basal leaflets each replaced by 3 leaflets; leaflets roundish to ovate, toothed and often 3-lobed, often cordate at base, ¼ to 1 in. long; peduncles 1 (or 3)-flowered, ¾ to 1 in. long; flowers ¾ to 1 in. broad; sepals 4 or 3; achenes glabrous, their tails about 1 in. long.—Trailing over rocks or clambering over bushes: cismontane S. Cal. Mar.-Apr.

CÁLYCANTHÀCEAE. Sweet-shrub Family

Aromatic shrubs with opposite entire leaves and no stipules. Flowers large, solitary, terminating the branches. Bracts, sepals and petals passing into each other, imbricated in many series, adnate at base to the enlarged hollow receptacle which is like a rose-cup. Stamens numerous, the inner ones sterile. Pistils many, distinct, nearly inclosed in the hollow receptacle, becoming achenes.

1. CALYCÁNTHUS L.

Flowers livid red. Petals in several rows at mouth of tube, the inner ones shorter. Styles equaling the anthers, filiform, colorless. Seed without endosperm; cotyledons foliaceous, convolute, caulicle inferior. (Greek kalyx, covering or calyx, and anthos, flower.)

1. **C. óccidentàlis** H. & A. Spice Bush. Sweet Shrub. Fig. 389. Erect branching shrub 5 to 9 ft. high; leaves ovate to oblong-lanceolate, acute, rounded at base, 1½ to 6 in. long; sepals and petals linear-spatulate, 1¼ in. long or less, the upper ½ or ⅓ fading tawny or brown in age; filaments ⅓ line long; fruiting receptacle cup-like, 1 to 1¼ in. long; achenes oblong-ovate, slightly oblique or curved, a trifle flattened and bordered all around with a granular margin, somewhat velvety-hirsute, 4 to 5 lines long. — Along cañon streams in the North Coast Ranges and Sierra Nevada foothills, 800 to 3800 ft.

389. Calycanthus occidentalis H. & A.; *a*, fl. branchlet; *b*, fr. receptacle. x½.

BERBERIDÀCEAE. Barberry Family

Shrubs or herbs, ours with alternate compound leaves. Flowers perfect, regular, hypogynous. Sepals 6, in 2 circles. Petals 6, in 2 circles, the stamens as many and opposite them. Anthers opening by an uplifting valve or lid. Ovary one, superior, 1-celled, becoming in fruit a capsule, a berry, or dry and coriaceous. Seeds with endosperm.—Achlys is anomalous; it has no perianth and 9 to 13 stamens.

Shrubs or low woody plants; leaves pinnate, prickly; petals bifid.....1. Berberis.
Perennial herbs; leaves all basal, ternate, not prickly.
Calyx and corolla none; leaves with 3 sessile leaflets.....2. Achlys.
Calyx and corolla present, reflexed; petals entire; petioles once or twice ternately divided, the divisions bearing 3 (rarely 1) petiolulate leaflets.....
3. Vancouveria.

1. BÉRBERIS L. Barberry

Evergreen shrubs or low suffrutescent plants with yellow wood. Leaves alternate, prickly, in ours pinnately compound with the rachis jointed at the insertion of the leaflets. Flowers yellow, in racemes. Sepals petal-like, subtended by 3 somewhat colored bractlets. Petals concave, in ours distinctly bifid. Filaments irritable. Stigma peltate-umbilicate. Fruit a berry. (Arabic name.)

Filaments with a pair of recurved teeth near the apex; racemes short, from small terminal or lateral buds; bud-scales few, deciduous, small (1 to 2 lines long); leaflets 3 to 9, pinnately veined.
Leaflets with comparatively few (mostly 5 to 15) teeth, the teeth strongly spinose; erect shrubs of dry inner ridges or of the desert.
Racemes loosely few-flowered.
Leaflets equal or nearly so; tooth-like lobes of the leaflets coarse, mostly subequal.....1. *B. fremontii.*
Terminal leaflet much longer than the lateral ones; terminal lanceolate tooth of each leaflet often entire, many times larger than the small lateral teeth.....2. *B. nevinii.*
Racemes densely many-flowered; teeth of the leaflets very coarse.....3. *B. californica.*
Leaflets with more numerous teeth.
Foliage not very dense; leaflets with many teeth.
Low (about ½ to 1 ft. high).
Stems erect or ascending; leaflets mostly pale or glaucescent above, mostly glaucous or whitish beneath, their teeth spine-tipped..4. *B. pumila.*
Stems prostrate or ascending; leaflets dull, their teeth bristle-tipped....5. *B. repens.*
Erect, 1 to 3 ft. high; leaflets shining above, their teeth spine-tipped.....6. *B. aquifolium.*
Foliage mostly forming a dense terminal fascicle; leaflets thin, with numerous small bristle-tipped teeth; coast region.....7. *B. pinnata.*
Filaments without teeth; racemes elongated, loose, solitary or few from a terminal bud; bud-scales large (¾ to 1¾ in. long), persistent; leaflets 11 to 21, somewhat palmately veined.....8. *B. nervosa.*

1. **B. fremóntii** Torr. DESERT BARBERRY. Shrub 5 to 8 (or 15) ft. high; leaflets 5, ovate, rigidly coriaceous, yellowish or glaucous, scarcely at all or only moderately undulate, 6 to 12 lines long, strongly and sinuately 5 or 7-lobed, the lobes strongly spinose; petiole articulated near the base or often a supplementary pair of leaflets borne at this point; racemes few (3 to 9)-flowered, 1 to 1¼ in. long, the peduncles as long or almost none; berries at maturity dull brown, somewhat inflated, 5 to 6 lines in diameter.—Mt. slopes: e. Mohave Desert; Colorado Desert; e. to Ariz. and s. Nev., s. to L. Cal. and Sonora. May-June.

2. **B. nevínii** Gray. Shrub 6 to 8 ft. high, with many erect loose branches; leaflets 5, ½ to 1¼ in. long, the lateral oblong, the terminal one broadly lanceolate, acuminate, all with few and small spinose teeth; petioles almost none; racemes loosely 5 to 7-flowered.—Sandy slopes: e. edge of San Fernando Valley; Arroyo Seco, San Gabriel Mts. (F. W. Peirson); very rare; closely allied to B. fremontii.

3. **B. califórnica** Jepson. Stems rigidly erect, 3 to 6 (or 10) ft. high, little branched; leaves 1½ to 4 in. long; leaflets 5 to 9, ovate, 1 to 2 in. long, very pale or glaucescent, strongly reticulate, repandly dentate, the 8 to 12 teeth ending in long stout spines, their length ⅓ to ⅔ the breadth of the body of the blade, the blade so strongly undulate that the spines are presented in nearly all directions; racemes 1 to 2 in. long, the pedicels mostly 3 to 5 lines long.—Dry rocky interior foothills, 300 to 1500 ft. or up to 6000 ft. on arid ridges: Inner Coast Range, s. to cismontane S. Cal.; apparently also in s. Sierra Nevada foothills.

4. **B. pūmila** Greene. Stems erect, rigid, 5 to 14 in. high; leaflets 5 (3 to 7), broadly ovate, whitish, glaucescent or dull green, 1¼ to 2¼ in. long, the rather coarse or medium-sized teeth about 10 to 18, spine-tipped; racemes dense, 1 to 1½ in. long; berries blue, small, oblong.—Inner North Coast Range and higher Sierra Nevada foothills; n. to southern Ore.; 3000 to 5000 ft.

5. **B. rèpens** Lindl. CREEPING BARBERRY. Stems ascending from a creeping or stolon-like base, simple, 4 to 6 in. high; leaflets 3 to 5, plane or nearly so, dull above, paler beneath, with many small teeth and weak spines; racemes rather dense, 2 to 2½ in. long; berries blue-glaucous.—Del Norte Co. to Modoc Co., thence s. to Inyo Co.; n. to B. C., e. to Rocky Mts.

6. **B. aquifòlium** Pursh. MOUNTAIN GRAPE. Stems erect, 1 to 3 ft. high; leaves thin-coriaceous, bright-green and glossy-shining above, duller beneath; leaflets plane, 3 to 5 or 7, elliptic-ovate to oblong-ovate, 1¼ to 3 in. long, the margin with many long slender spines; lowest pair of leaflets remote

from base of petiole; racemes fascicled in the axils and at the summit, dense, 1 to 2 in. long; berries blue, glaucous, rather large.—North Coast Ranges from Napa Co. to Humboldt Co.; n. Sierra Nevada from Amador Co. to Modoc Co.; n. to B. C. Var. DICTYÒTA Jepson. Erect, stout, ½ to 1 ft. high, sparsely leafy; leaflets 5 to 7, broadly ovate, prominently reticulated, shining and yellow above, paler beneath, 1 to 2¼ in. long, undulate, sinuous-dentate, the 10 to 20 teeth with strong spines; lowest pair of leaflets close to base of petiole; racemes dense, ¾ to 1 in. long.—Rocky slopes, Marysville Buttes.

390. Berberis pinnata Lag.; *a*, fl. branch x ½; *b*, fl. x 1; *c*, stamen x 4.

7. **B. pinnàta** Lag. CALIFORNIA BARBERRY. Fig. 390. Stems erect, stout, branching, ¼ to 1½ ft. high (or even to 4 or 5 ft.); leaves 2 to 4 in. long; leaflets usually 7 to 13, but sometimes 5 to 17, rather crowded on the rachis, ovate-elliptical to oblong, thinnish and plane, somewhat bubbly-undulate, 1 to 2¼ in. long, shining above, somewhat paler beneath, shallowly sinuate-dentate, the numerous teeth prickly; lowest pair close to base of petiole; racemes clustered, dense.—Hill summits and slopes, mostly along the edge of thickets, near the coast from Marin Co. to San Diego Co. Mar.-Apr.

8. **B. nervòsa** Pursh. OREGON GRAPE. Stem scaly, caudex-like, simple, ½ to 1 (or 2) ft. high, bearing the leaves in a terminal tuft; leaves 9 to 16 in. long, the rachis conspicuously nodose; leaflets 11 to 21, bright green, ovate to ovate-lanceolate, spinulose-serrate, and somewhat palmately nerved, 1½ to 3 in. long; scales of the strong terminal bud ¾ to 1¾ in. long, coriaceous-glumaceous; racemes erect, elongated, 2 to 4 (or 6) in. long; bracts oblong to lanceolate, membranaceous; berries blue-glaucous, 4 to 5 lines in diameter.—Woods near the coast from the Santa Lucia Mts. to Shasta and Siskiyou Cos.; n. to B. C.

2. ÁCHLYS DC.

Perennial herbs with long-petioled 3-foliolate leaves and leafless scapes rising from a very slender rootstock. Flowers perfect, in a short dense spike. Calyx and corolla none. Stamens 9 to 13, 2 to 3 times as long as ovary, the outer dilated upward. Fruit dry, indehiscent, broadly moon-shaped. (Greek Achlus, the god of night or gloom.)

1. **A. triphýlla** (Sm.) DC. DEER-FOOT. Plants about 1 ft. high; leaflets fan-shaped, sinuate-dentate, 2 to 6 in. broad.—Woods near the coast, 100 to 2500 ft., Mendocino Co. to Humboldt Co.; n. to B. C. Also called Sweet Leaf. Settlers on the Humboldt coast, prizing the delicate fragrance, hang bunches of the leaves in their houses.

3. VANCOUVÈRIA Morr. & Dec.

Low perennial herbs with slender creeping rootstocks. Leaves once or twice ternately compound, all basal or nearly so. Flowers small, nodding, arranged in an open panicle on a slender scape-like peduncle. Sepals 6, in 2 series, obovate, petal-like, reflexed, subtended by 6 to 9 small calyx-like membranous bractlets. Petals 6, ligulate, tipped with a hood-like nectar-bear-

ing appendage, reflexed. Stamens 6, closely erect about the pistil, the anther connective produced into a pointed tip. Style 1; stigma thin, cup-shaped. Fruit a follicle. Seeds with an aril. (Capt. George Vancouver of the English exploring ship Discovery, who visited San Francisco Bay in 1792.)

Leaflets with cartilaginous-margin; panicle beset with gland-tipped hairs; stamens glabrous.....1. *V. parviflora.*
Leaflets not cartilaginous-margined; panicle glabrous; stamens covered with short gland-tipped hairs.....2. *V. hexandra.*

1. **V. parviflòra** Greene. INSIDE-OUT FLOWER. Stems 8 to 20 in. high, sparsely hairy, at base rusty-pilose, the panicle pubescent with short spreading gland-tipped hairs; leaves glabrous or with rusty hairs on the petioles at the forks, persisting through the winter; leaflets thickish, roundish in outline, broadly cordate at base, with mostly closed sinus, obscurely or evidently 3-lobed with a notch at the summit of each lobe, ¾ to 1½ in. long, frequently broader than long, the margin cartilaginous and often crisped; panicle 2½ to 7 in. long, 25 to 55-flowered; flowers white or lavender-tinged, 4 lines long; sepals 2 lines long; stamens glabrous.—Shade of coniferous forests, mostly in the Redwood region, from the Santa Lucia Mts. to Humboldt Co.; n. to Ore. May-June.

2. **V. hexándra** (Hook.) Morr. & Dec. Flowering stems 7 to 21 in. high; leaves sparingly pubescent with short scattered hairs, perishing after the maturing of the fruit; leaflets thinnish, ovate to oval or roundish in outline (seldom broader than long), ¾ to 1½ in. long, cordate at base with open sinus, 3-lobed at apex (the middle lobe largest); panicle glabrous, 10 to 25-flowered; flowers 6 lines long; sepals 3 lines long; sepals and petals pearly white; stamens covered with small stipitate glands; ovules 3 in each cell.—Woods, 500 to 3000 (or even 4000) ft.: Mendocino Co. to Siskiyou Co.; n. to Wash. Commonly in deeper shade than V. parviflora. May-June.

LAURÀCEAE. LAUREL FAMILY

Aromatic evergreen trees and shrubs with alternate simple leaves and no stipules. Flowers perfect, regular. Petals none. Anthers opening by uplifted valves. Ovary superior, 1-celled, 1-ovuled, with a single style. Fruit in ours a drupe.

1. UMBÉLLULÀRIA Nutt.

Flowers in simple peduncled umbels. Sepals 6. Stamens 9, the three inner with stipitate orange-colored gland on each side of the filament at base and alternating with scale-like staminodia; anthers 4-celled, 4-valved, the three inner extrorse, the outer introrse. (Latin umbellularia, a little umbel.)

391. Umbellaria californica Nutt.; fr. branchlet x ½.

1. **U. califórnica** Nutt. CALIFORNIA LAUREL. Fig. 391. Tree 20 to 60 ft. high with a dense crown of erect slender branches, or in the chaparral as a mere shrub; leaves oblong or oblong-lanceolate, entire, 2½ to 4½ in. long, on short petioles; umbels 4 to 9-flowered, but setting only 1 to 3 (rarely 6) fruits; flowers 2 lines long; drupe subglobose or ovoid, 1 in. long, greenish, or when ripe brown-purple.—Cañon walls, mountain slopes and stream flats: Coast Ranges and Sierra Nevada, s. to San Diego Co. and n. to southern Ore. It is most abundant and of greatest size on the alluvial river flats of northwestern California and adja-

cent Oregon. Also called Bay Tree and Bay Laurel, but in the woods of Mendocino and Humboldt the name "Pepperwood" is the only one in use, while in Oregon the name "Myrtle" replaces all others. The wood is prized by the cabinet-maker.

PAPAVERÀCEAE. Poppy Family

Herbs or shrubs with mostly colored juice and regular complete flowers. Sepals 2 or 3, caducous, the petals twice as many. Calyx in Eschscholtzia resembling a fool's cap, the 2 sepals completely united into a single piece. Stamens numerous, rarely few. Pistil 1, composed of 2 to several united carpels; ovary superior, 1-celled (several-celled in Romneya); in Platystemon the lightly united carpels become distinct in fruit.

Sepals distinct, caducous; receptacle not hollowed (slightly hollowed in no. 6).
- Leaves usually opposite or whorled, entire; annual herbs.
  - Stamens numerous; carpels lightly joined, distinct in fruit....1. Platystemon.
  - Stamens 6 to 12 or numerous; carpels combined into a 3-angled or linear ovary.. 2. Meconella.
- Leaves alternate or mainly so, often in a basal tuft.
  - Stamens 6 to 9; minute annual.....3. Canbya.
  - Stamens many or numerous.
    - Herbs; leaves toothed, lobed or pinnatifid.
      - Petals deciduous; stigmas opposite (that is, over) the placentae.
        - Flower buds erect; petals white; herbage prickly...4. Argemone.
        - Flower buds drooping; petals red; herbage not prickly.5. Papaver.
      - Petals persistent around the capsule; stigmas alternate with the placentae; herbage not prickly.....6. Arctomecon.
    - Shrubs or at least woody at base.
      - Petals white; leaves pinnatifid; capsule ovate, 7 to 12-valved..... 7. Romneya.
      - Petals yellow; leaves entire or merely denticulate; capsule linear, 2-valved.....8. Dendromecon.

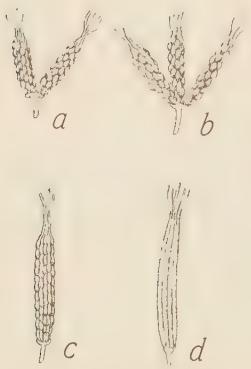
Sepals united into a calyptra or foolscap body which is pushed off by the 4 expanding petals; receptacle hollowed; herbs.....9. Eschscholtzia.

1. PLATYSTÈMON Benth.

Low annual with mainly opposite entire leaves. Sepals 3. Petals 6 in two series, tardily deciduous, withering and closing over the forming fruit. Stamens numerous; filaments more or less dilated and petal-like. Stigmas subulate-filiform, one terminating each carpel; carpels 6 to 17 or 20, each several-ovuled, connivent or coherent in a circle, becoming moniliform, at maturity separating and breaking transversely into indehiscent 1 seeded joints. (Greek platus, broad, and stemon, a stamen.)

1. **P. californicus** Benth. Cream Cups. Figs. 392, 393. Branched from the base, the branchlets widely spreading and more or less decumbent, or often erect, 3 to 9 (or 12) in.

392. Platystemon californicum Benth.; *a*, habit x ¼; *b*, fl. x 1; *c-e*, stamens showing variations in filaments x 4; *f*, circle of moniliform carpels x 1½.



393. Platystemon californicus Benth.; *a*, fl. bearing 2 distinct gynoecia, each gynoecium composed of several normal carpels; *b*, fl. with 3 gynoecia; *c*, fl. with moniliform carpels; *d*, fl. (from same plant as *c*) with cylindric carpels. x 1.

high, the leaves often borne on the lower part (or wholly basal) and the peduncles therefore more or less scape-like and 2 to 7 (or 10) in. long; herbage pilose; buds round-obovoid, elliptic or oblong, long-hairy; petals commonly cream yellow, 3 or 6 to 11 lines long.—Foothills, plains and valleys, in sandy or clay soils, common almost throughout Cal., but absent from the deserts, except the w. margins of the Colorado and Mohave; e. to Ariz. and Utah, s. to L. Cal. Passes into the varieties. Var. CRINÌTUS Greene. Peduncles and buds with longer hairs, often densely pilose; buds globose; petals yellow, often with pink or greenish tips.—Tehachapi Mts., s. to the Cuyamaca Mts. Var. HORRÍDULUS Jepson. Petals spreading nearly rotately from a turbinate or almost cylindric base 3 to 4 lines long; carpels white when young with a dense covering of stiffish hairs, the hairs rapidly deciduous and the carpels soon becoming only thinly hairy.—S. Sierra Nevada foothills from Fresno Co. to Tulare Co., 3500 to 5000 ft. Var. NÙTANS Bdg. Fruits nodding.—San Diego; Santa Cruz Isl.

2. **MECONÉLLA** Nutt.

Low annuals with opposite leaves. Sepals 3, rarely 2. Petals 6, rarely 4, deciduous. Stamens 6 to 12, or numerous. Carpels 3, combined into a single 1-celled ovary, which is 3-lobed or nearly terete. Placentae as many as the carpels, parietal, many-ovuled. Stigmas ovate to subulate. Capsule completely 3-valved, dehiscent through the placentae. (Greek mekon, poppy, and ella, diminutive.)

Plants with the leaves all basal or sub-basal and with unbranched hairy scapes; petals light yellow; ovary and capsule narrowly obovoid, 3-lobed.....1. *M. linearis.*
Plants with branching leafy stems and glabrous peduncles; petals white; ovary and capsule linear.....2. *M. oregana.*

1. **M. lineàris** (Benth.) Jepson. Fig. 394. Plants with the leaves all basal or nearly so, the scapes 4 to 8 in. high and hispid with spreading hairs; leaves linear, 1 to 2¼ in. long, sessile; sepals brownish; petals light yellow, cuneate-orbicular or obovate, 4 to 9 lines long; stamens numerous, filaments linear or oblong-dilated, rarely filiform; body of capsule 5 to 7 lines long.—Sandy soil in the Coast Ranges from Sonoma Co. to Santa Barbara Co., chiefly near the coast, but inland to the s. Sierra Nevada (Fresno Co. to Kern Co.); Ore. Mar. Apr. (Platystigma lineare Benth.) Var. PULCHÉLLA Jepson. Outer petals yellow, inner white.—Coast from San Francisco to Sonoma Co.

2. **M. oregàna** Nutt. var. **californica** Jepson. Fig. 395. Very slender, erect, branching, 4 to 7 in. high, glabrous throughout; leaves entire, the basal and lower ones elliptic to obovate-spatulate, ½ to 1 or 1½ in. long, commonly contracted to a petiole, the upper cauline oblanceolate to linear; peduncles 2 to 3 in. long, erect in anthesis, in fruit deflexed almost horizontally but the capsule vertical or nearly so; sepals often reddish; petals

394. Meconella linearis Jepson; *a*, habit; *b*, capsule. x ½

395. Meconella oregana var. californica Jepson; *a*, habit; *b*, capsule. x 1.

white, elliptic to oblong, 2 to 5 lines long; stamens 12, unequal, in two series, the outer shorter; filaments filiform or slightly dilated upwards; capsule linear, twisted, ½ to 1 (rarely 1½) in. long.—Sierra Nevada foothills from Shasta Co. to Amador Co.; San Francisco Bay region. Var. OCTÁNDRA Jepson. Petals almost fan-shaped; stamens 8, the 4 outer shorter.—S. Sierra foothills (or their bordering plains) from Merced Co. to Tulare Co. Var. DENTICULÀTA Jepson. Leaves entire, sometimes denticulate; stamens 6, in one set.—Cismontane S. Cal. from Santa Inez Mts. to San Diego Co.

3. **CÁNBYA** Parry

Minute glabrous annuals with the leaves crowded in a dense basal tuft on the very shortly branched stems. Leaves mostly alternate, linear, fleshy, entire. Flowers on axillary filiform pedicels. Sepals 3. Petals 6, white, after anthesis withering and closing over the capsule. Stamens 6 (or 5) to 9. Ovary 1-celled, with 3 nerve-like placentae. Style none. Stigmas 3, linear, radiate-recurved and appressed to the subglobose ovary. Ovules several. (W. M. Canby, botanist of Delaware.)

1. **C. cándida** Parry. Fig. 396. Plants 1 in. high; leaves fleshy, 2 to 4 lines long; petals roundish, 1 to 1¾ lines long.—Sandy washes, Mohave Desert, 2000 to 3500 ft. Apr.-May.

4. **ARGEMÒNE** L.

Annual herbs with acrid orange juice, prickly sinuate or pinnatifid leaves and flowers erect in the bud. Sepals 2 (often 3), with a horn-like appendage below the apex. Petals white, twice as many as the sepals. Ovary 1-celled; stigmas radiate. Capsule 4 to 6-valved at summit. (Greek name of some herb, transferred here.)

Calyx rather densely spiny; horn-like appendage of sepals large or conspicuous, spine-tipped and with many spines over its surface; flowers not corymbose.....1. *A. platyceras.*

Calyx with scattered spines; horn-like appendage of sepals small or inconspicuous, spine-tipped, its surface otherwise unarmed; flowers corymbose. 2. *A. intermedia.*

396. Canbya candida Parry; *a*, habit x 1; *b*, fl. x 2.

1. **A. platýceras** Link & Otto. CHICALOTE. Stems stout, branched, more or less prickly with long yellow spines, 1½ to 2¾ ft. high; herbage glaucescent; leaves oblong, sinuate-pinnatifid into spinose-toothed lobes, tapering to a winged petiole, spinose chiefly along the margin and along the main veins, 2 to 9 in. long; flowers in leafy-bracteate panicles; sepals 3, spiny, each with a horn at apex, the horns lanceolate, spiny on the sides and strongly spine-tipped; petals 6, obovate, truncate, 1 to 2 in. long; capsule narrowly cylindrical, 1½ to 2 in. long, the valves firm, becoming somewhat indurated, densely spiny.—S. Cal.; e. to Tex. Apr.-July. Passing by intergrades into

the var. HÍSPIDA Prain, the whole plant densely setose-hispid as well as armed with stouter yellow spines.—Mt. valleys or cañon flats, 2000 to 8000 ft.: Coast Ranges; e. side of the Sierra Nevada; mts. of S. Cal. June-Sept. Sometimes perennial.

2. **A. intermèdia** Sweet var. **corymbòsa** Eastw. PRICKLY POPPY. Plants 1 to 3 ft. high, prickly with stout yellow spines; leaves oblong to obovate or the upper ovate, repand-toothed to sinuate-pinnatifid; flowers fragrant, somewhat regularly corymbose; petals 10 to 14 lines (sometimes to 1½ in.) long; capsule ¾ in. long.—Mohave Desert. May-June.

5. PAPÀVER L. POPPY

Erect herbs (ours annual) with narcotic juice. Leaves pinnately cleft, lobed or divided. Flowers showy, solitary on long peduncles, nodding in bud. Sepals 2. Petals 4, in ours red. Stamens very many. Ovary and capsule obovoid to subglobose, with 4 to many intruded placentae. Capsule opening by holes just below the summit. (Latin name of the poppy.)

Juice milky; stigmas sessile and radiate upon the summit of the ovary.—Subgenus EUPAPAVER.....1. *P. californicum.*
Juice yellow; stigmas capitate upon the short slender style.—Subgenus MECONOPSIS.....
2. *P. heterophyllum.*

397. Papaver californicum Gray; capsule x 1½.

1. **P. californicum** Gray. WESTERN POPPY. Fig. 397. Glabrous or sparsely pilose-pubescent, 1½ to 2 ft. high; juice milky; leaves pinnately divided, the segments oblong or roundish, toothed, lobed, or incised; petals red with a green spot at base, 7 to 10 lines long; stigmas sessile and radiate upon the summit of the ovary, forming a sort of "skull cap." persistent in fruit; capsule turbinate-obovate, 6 to 7 lines long.—Cismontane S. Cal., n. to Marin Co. Apr.-May.

2. **P. heterophýllum** (Benth.) Greene. WIND POPPY. Fig. 398. Glabrous, 1½ to 2 ft. high; juice yellow; leaves pinnate or pinnately divided, the segments entire, toothed or divided, exceedingly diverse in shape even on the same plant or the same leaf, varying from oval to narrowly linear; petals brick-red with a dark spot at base, broadly cuneate-obovate, ½ to 1 in. long; stigmas capitate at summit of a distinct and slender style; capsule clavate-obovoid, 4 to 7 lines long.—Hill slopes and valley fields: Lake Co.; South Coast Ranges; San Joaquin Valley and s. Sierra Nevada from Kern Co. to Fresno Co.; coastal S. Cal.; s. to L. Cal. May.

398. Papaver heterophyllum Greene: *a*, habit x ½; *b*, *c*, different leaf types x ¼; *d*, capsule x 1.

6. ARCTOMÈCON Torr. & Frem.

Herbs with a stout tap root. Leaves long-hirsute, crowded toward the base of the plant. Flowers large, white or yellow, solitary or in an umbelliform cluster. Sepals 2 or 3. Petals 4 or 6, round-obovate, in age persisting around the base of the capsule. Stamens numerous, short. Ovary and subcoriaceous capsule ovoid or obovoid, 3 to 6 (commonly 4)-valved; style shorter than the globular and lobulate mass of 3 to 6 erect and somewhat united stigmas. Seeds rather few, oblong. (Greek arctos, a bear, and mecon, poppy, from the hirsuteness.)

1. **A. merriàmii** Cov. DESERT POPPY. Plants 1 ft. high, the stems somewhat branched near the base; herbage glaucous; leaves mostly basal, cuneate-flabelliform, petiolate, coarsely toothed at apex, hirsute with long brown hairs, 3 to 7½

399. Romneya coulteri Harv.; *a*, fl.; *b*, bud. x ¼.

lines long, the cauline shorter; flowers 1½ to 2 in. broad, solitary on long naked peduncles; sepals 3, villous; petals 6, white; filaments slender, slightly dilated upwards; stigmas sessile.—E. Inyo Co. and s. Nev. Apr.

7. RÓMNEYA Harv.

Tall glabrous perennial from a soft woody base, with colorless bitter juice and alternate pinnatifid leaves. Corolla very large, bright white, with frilled petals. Stamens very numerous. Ovary and coriaceous capsule with 7 to 12 plate-like placentae, some of which meet in the axis and form partitions. Style none. Stigmas 7 to 12, partly coherent in a ring. (The astronomer, T. Romney Robinson of Dublin, friend of Dr. Thos. Coulter, the discoverer of the plant.)

1. **R. còulteri** Harv. MATILIJA POPPY. Fig. 399. Stems branching, leafy, 3 to 8 ft. high; herbage glabrous, glaucescent; leaves petiolate, pinnately parted or divided into 3 to 9 cuneate-oblong to lanceolate divisions or leaflets, these sparingly dentate or the terminal one 3-cleft, the margins and rachis often sparsely spinulose-ciliate; flowers short-peduncled, terminal, not drooping in bud, delicately fragrant, lasting a few days; calyx glabrous, somewhat beaked; corolla 3 to 5 in. broad; capsule ovate to oblong, 1½ in. long, strigose-hispid, the 7 to 12 valves opening from the summit downward; seeds slightly incurved with dull roughish coat.—Washes and cañon beds, 1000 to 2500 ft., coastal S. Cal. from Santa Barbara Co. to San Diego Co.; s. to L. Cal. May-June. Var. TRICHÒCALYX Jepson. Calyx setose, beakless or nearly so.—Range of the species.

8. DENDROMÈCON Benth.

Glabrous evergreen shrub with alternate entire coriaceous leaves and golden yellow flowers. Sepals 2. Petals 4. Stamens numerous, with short filiform filaments and linear anthers. Style short, bearing 2 oblong stigmas. Capsule linear, curved, its two valves separating tardily or incompletely from the 2 thread-like placentae. Seeds pitted, provided with a caruncle. (Greek dendron, tree, and mecon, poppy.)

1. **D. rígida** Benth. BUSH POPPY. Fig. 400. Stems few to many from the base, 2 to 4 (or 8) ft. high, the main stem bark shreddy; branches whitish; leaves yellowish green, oblong- to linear-lanceolate, reticulate, minutely denticulate, mucronate, 1 to 3½ in. long, borne on very short petioles which, by a twist, bring the blade vertical; flowers on peduncles 1 to 3 in. long; corolla 1 to 2½ in. in diameter; capsule 2 to 4 in. long.—Dry slopes and ridges at middle altitudes (1000 to 3000 ft.): Coast Ranges and Sierra Nevada, n. to Shasta Co. and s. to cismontane S. Cal. May-June. Var. HARFÓRDII K. Bdg.

400. Dendromecon rigida Benth.; *a*, fl. branchlet x ½; *b*, dehiscing capsule x ½.

Tree-like or shrubby, 6 to 10 (or 18) ft. high, the branches more or less drooping; leaves elliptic, 1¼ to 5¼ in. long, entire, rarely minutely roughened.—Santa Barbara Isls.

9. **ESCHSCHÒLTZIA** Cham.

Annuals or perennials with watery juice, petioled ternately dissected leaves and peduncled yellow flowers. Receptacle hollowed or excavated, surrounding the base of the pistil, the calyx or corolla in consequence seeming as if perigynous; this receptacle (or torus) in addition often bearing a spreading outer and an erect inner rim. Sepals completely united into a calyptra or pointed cap-like body which parts from the receptacle and is pushed off by the expanding petals. Stamens many, mostly on the base of the petals; anthers commonly longer than the filaments. Ovary linear; style very short; stigmas commonly 4, subulate-filiform, unequal. Capsule 1-celled, many-seeded, 2-valved.—Dehiscence of the capsule commonly occurs in flight, after the capsule parts from the receptacle and before it reaches the ground, usually beginning at the moment that the base of the capsule is released from the vise-like hollowed receptacle, this action allowing the valves which are elastically dehiscent from base to apex, to separate. (Dr. J. F. Eschscholtz, college friend of Adelbert von Chamisso, German poet and naturalist, and his companion on Kotzebue's scientific voyage around the world.)

Cotyledons 2-cleft; receptacle (torus) with a collar-like rim; perennials (commonly flowering the first year) ..... 1. *E. californica.*
Cotyledons entire; receptacle (torus) without rim or with only a very narrow one; annuals.
  Stems more or less leafy.
    Petals 1 to 2⅔ lines long (longer in vars.); herbage usually glabrous; species of the Mohave and Colorado deserts ..... 2. *E. minutiflora.*
    Petals about ½ to 1 in. long; cismontane species.
      Herbage glabrous or nearly so.
        Stems stout; leaves very finely cut; insular species ..... 3. *E. elegans.*
        Stems slender; leaves not so finely cut; mainland species; var. hypecoides of ..... 6. *E. caespitosa.*
      Herbage hoary-pubescent with curled white hairs ..... 4. *E. lemmonii.*
  Stems scapose, the leaves all in a low basal tuft or sometimes a few sub-basal.
    Seeds strongly muricate with flattened processes, i.e., bur-like; leaf divisions long and rather few ..... 5. *E. lobbii.*
    Seeds not muricate; leaf divisions numerous.
      Seeds smooth or reticulate; leaves in a moderately dense tuft, the petioles unequal ..... 6. *E. caespitosa.*
      Seeds with large deep rather remote pits; leaves in a very dense tuft, the petioles about equal ..... 7. *E. glyptosperma.*

1. **E. califórnica** Cham. California Poppy. Fig. 401. Stems scapose or leafy, erect or diffuse, ¾ to 2 ft. high; basal leaves ternately several times dissected into linear or oblong segments, on long or short petioles, the whole leaf ⅓ to 1 ft. long; cauline smaller on short petioles; peduncles 2 or 3 to 6 in. long; petals fan-shaped, ½ to 2 in. long, varying from deep orange or copper-color to straw-color; outer spreading rim of the receptacle commonly ½ to 2 lines wide, the inner erect rim hyaline; capsule 1 to 3 or even 4 in. long.—Throughout cismontane Cal. in the valleys and foothills, 10 to 2000 ft. Widely naturalized in Aust. and India. Var. crócea Jepson. In the most marked form individual plants of this variety pass normally through two seasonal flowering stages. (a) Vernal stage: stems often many, mostly stiffly erect, 1 to 1½ (or 2) ft. high; herbage glaucous; flowers 1 or mostly 1½ to 2¼ in. long; buds 8 to 18 lines long, long-pointed; torus rim 1 to 2 lines broad; petals a deep rich orange; pods 2 to 3 in. long. (b) Aestival stage: stems fewer, diffuse, spreading or decumbent, ½ to 1 (or 1½) ft. long; flowers ¼ to ½ (or 1) in. long; buds 2 to 3 lines long, apiculate; torus rim ⅛ to ¼ line broad; petals pale or straw-yellow; pods 1 to 1½ in. long.—Interior valleys, particularly the Sacramento and San Joaquin, reaching its highest development and most marked differentiation into two distinct flowering stages, vernal and aestival, when in rich alluvial loams. Var. marítima Jepson. Stems leafy, early ascending, later becoming prostrate, ½ to 1 ft. long; herbage very glaucous, glabrous or minutely scaberulous or the pubescence often scurf-like; leaves with short crowded segments; calyptra of bud short-oblong, 4 to 5½ lines long, abruptly narrowed to a blunt or beaked

apex; petals ¾ in. long, lemon yellow with an orange spot at base; pod 1½ to 2 in. long; seeds nearly smooth.—San Miguel Isl. and coast of Santa Barbara Co., n. to Monterey Co. June-Sept.

2. **E. minùtiflòra** Wats. Stems several to many, branching, leafy and floriferous, 2 to 12 in. high, from a slender sometimes branched taproot; herbage glabrous (rarely pubescent), often glaucous; flowers on slender peduncles little or not at all exceeding the foliage; torus tubular-campanulate, the rim not expanded but often obscurely fluted, a hyaline internal edge commonly a little projecting; petals 1 to 2⅔ lines long; seeds spherical or nearly so, reticulate.—Colorado and Mohave deserts, the bordering ranges, and n. to Inyo Co.; e. to Utah and Ariz. Apr.-June. Var. PARÍSHII Jepson. Petals 3 to 6 (or 7) lines long.—Colorado and Mohave deserts, n. to Inyo Co. and the Sierra Nevada in Kern Co. Var. RUTAEFÒLIA Jepson. Stems slender, many from the base; leaves ternate or biternate, the lobes broadly cuneiform.—Havilah, Kern Co.

401. Eschscholtzia californica Cham. The form of the interior valleys (var. crocea Jepson) commonly shows two distinct flowering stages: the vernal flowering stage (a) with stout erect stems and large bronze-gold corollas and broad torus rim (b); and the summer and autumnal flowering stage (c) with slender diffuse stems and small straw-yellow corollas and narrow or obsolescent torus rim (d). The branchlet *a* was drawn in April, the branchlet *c* in August; both were taken from the same root-crown. These figures (x ½) illustrate the great range of variation which occurs in individual plants of this species. *e*, seed x 6.

402. Eschscholtzia lobbii Greene; *a*, habit x ⅝; *b*, seed x 5.

3. **E. élegans** Greene. Stout leafy-stemmed annual, much branched above the base, 1 ft. high; herbage glaucous, glabrous or slightly scabrous; leaves very finely cut; torus narrow-campanulate, the scarious inner ring conspicuous; corolla ½ in. long; mature seeds reticulate.—Santa Barbara Isls. Apr.-May.

4. **E. lemmònii** Greene. Stems usually somewhat leafy, branching, 6 to 12 in. high; herbage more or less pubescent with white hairs; torus urn-shaped, glabrous, 3 to 4 lines long; calyptra white-pubescent; petals orange, ½ to 1 in. long; capsule 1¼ to 2½ in. long.—San Carlos Range and s. to e. San Luis Obispo Co. May-June. Var. ASPRÉLLA Jepson. Buds lightly pubescent to quite glabrous.—Plaskett Ranch, King City; Waltham Creek, San Carlos Range.

5. **E. lóbbii** Greene. FRYING-PANS. Fig. 402. Scapose, 4 to 8 (or 11) in. high, the leaves in a basal or sub-basal tuft with comparatively few linear or linear-lanceolate to almost filiform divisions; petals light yellow, 3 to 6 lines long; seeds strongly muricate with flattened processes, i. e., bur-like.—

Sterile gravelly or clay foothills and rolling valley plains, 100 to 2000 ft.: Sierra Nevada foothills; foothills of inner North Coast Ranges and the Sacramento Valley. Mar.-Apr.

6. **E. caespitòsa** Benth. Stems usually scapose, several to many from a tuft of basal leaves, 3 to 9 in. high, far exceeding the leaves; herbage glaucous, glabrous or below somewhat hispidulous; leaves cut into rather numerous narrow lobes; torus turbinate to oblong-turbinate; petals pure yellow, ½ to 1 in. long; seeds longer than broad, abruptly acute, lightly reticulate or almost smooth.—South Coast Ranges and s. to Los Angeles Co. Apr.-May. Var. RHOMBIPÉTALA Jepson. Similar in habit but the scapes hardly exceeding the leaves; torus about twice as long as broad; petals fugacious; seeds reticulate-pitted.—Foothills and plains at e. base of Mt. Diablo Range. Var. HYPECOÌDES Gray. Stems slender, leafy, somewhat branched, 3 to 12 (or 18) in. high; petals ⅓ to 1 in. long; seeds spherical or slightly elongate.—Fertile hillslopes: Sierra Nevada foothills from Kern Co. to Butte Co., about 1200 to 2500 ft.; Coast Ranges from Monterey Co. to Trinity Co., 100 to 2000 ft.

7. **E. glyptospérma** Greene. Glaucous annual with densely tufted nearly equal basal leaves; stems numerous, scapose, slender, rather stiffly erect, usually 3 to 7 in. high, far exceeding the leaves; leaves much dissected into short crowded linear divisions; petals broad, 5 to 7 (or 10) lines long; capsule 1½ to 2 in. long; seeds globose, coarsely pitted and without reticulation. the pits rather distant.—Mohave Desert; e. to Utah. May.

FUMÀRIÀCEAE. Fumitory Family

Ours glabrous perennial herbs with alternate compound dissected leaves and irregular perfect flowers. Sepals 2, small and scale-like. Petals 4, in 2 dissimilar pairs, the outer larger, inner pair narrower, carinate or crested on the back, cohering by the callous apex and covering the anthers and stigma. Stamens in 2 sets of 3 each, placed opposite the outer petals, the filaments of each set usually united; middle anther of each set 2-celled, the lateral ones 1-celled. Ovary superior. Capsule 1-celled, with 2 parietal rib-like placentae from which the valves separate, or indehiscent.

Corolla 2-spurred or 2-saccate at base.....1. DICENTRA.
Corolla 1-spurred at base.....2. CORYDALIS.

1. DICÉNTRA Bernh. Dutchman's Breeches

Flowers in racemes or panicles, or solitary. Corolla flattened and cordate at base. Filaments of each set dilated and united, but distinct at the very base and slightly free above. (Greek dis, twice, and kentron, a spur, some species 2-spurred.)

Stems leafy, tall; flowers yellow, erect; corolla deciduous; petals distinct; crests of the inner petals tubular; seeds crestless.
  Flowers sulphur-yellow; outer petals spreading or recurving to the middle; widely scattered.....1. *D. chrysantha.*
  Flowers straw-yellow or cream-color; outer petals erect or only the tips spreading; seaward South Coast Ranges.....2. *D. ochroleuca.*
Stems naked, scape-like, the leaves all basal; flowers more or less nodding; corolla withering-persistent; sepals persistent or at least not caducous; seeds crested.
  Flowers rose-purple; petals united; crests of inner petals tubular, conspicuous; scapes tall, bearing a cluster of racemes.....3. *D. formosa.*
  Flowers whitish or flesh-color; petals distinct, the outer with narrow recurving tips; crests of inner petals none or obscure; diminutive alpine herbs, the scapes 1 or 2 (or 3)-flowered.
    Recurving tips longer than the body of outer petals.....4. *D. uniflora.*
    Recurving tips shorter than the body of outer petals.....5. *D. pauciflora.*

1. **D. chrysántha** (H. & A.) Walp. Golden Ear-drops. Fig. 403. Glaucous plants with stiff coarse leafy stems 2 to 5 ft. high, arising from stout roots; leaves bipinnate, ½ to 1 ft. long, the divisions cleft into narrow lobes; flowers yellow, in a large racemose panicle; corolla linear-oblong, only slightly cordate, 6 to 7 lines long; sepals somewhat caducous; outer petals spreading or recurving to the middle, saccate below the tip; crest of inner petals rather narrow, crisped or curly; capsule ¾ to 1¼ in. long.—High

403. Dicentra chrysantha Walp.; *a*, upper portion of leaf x ½; *b*, infl. x ½; *c*, capsule x 1; *d*, fl. x 1.

dry ridges of the inner ranges, 1000 to 5400 ft.: Coast Ranges from Mendocino Co. southw.; Sierra Nevada foothills from Calaveras Co. southw.; Ventura Co. to San Diego Co. Widely distributed but not common. June.

2. **D. ochroleùca** Engelm. Similar to D. chrysantha, 2 to 3 ft. high; panicle consisting of numerous flowers in one or few dense roundish clusters; sepals straw-color or brown, more persistent than in D. chrysantha; flowers pale or somewhat straw-yellow, ⅞ to 1 in. long; outer petals with only the tips spreading, the inner with purple tips and a broad crest.—Santa Ynez Mts. to the Santa Monica Mts. Apr.-June.

3. **D. formòsa** (Andr.) DC. BLEEDING HEART. Fig. 404. Flowering stems naked, scape-like, 8 to 18 in. high, somewhat exceeding the leaves, terminated by a cluster of short racemes; rootstock fleshy and spreading; leaves all basal, on very long petioles, biternately compound, the divisions incisely cleft or pinnatifid; corolla rose-purple (rarely white), ovate-cordate, 7 to 9 lines long, the petals all united to above the middle; sometimes one filament free in each stamen set. — Shady woods, Coast Ranges from Del Norte Co. to Alameda Co.; Sierra Nevada from Shasta Co. to Tulare Co.; n. to B. C. Apr.-June.

404. Dicentra formosa DC.; *a*, infl.; *b*, blade of leaf. x ½.

4. **D. uniflòra** Kell. STEER'S HEAD. Fig. 404a. Scapes 1 or 2-flowered, 1 to 3 in. high, arising from a fascicle of tubers; leaves triternately divided into oblong lobes; flowers white or pink; upper portion of outer petals very narrow, recurving to below the middle; inner petals spoon-shaped at apex, expanded downward, then abruptly truncate and borne by a claw-like base; fruiting scapes prostrate.—Rocky slopes, 6000 to 12,000 ft., Sierra Nevada from Fresno Co. n. to Siskiyou Co., thence s. to Humboldt Co.; n. to Wash., e. to Utah.

5. **D. pauciflòra** Wats. Scapes 4 to 5 in. high, 1 to 3-flowered, arising from fleshy creeping rootstocks; leaves similar to D. uniflora; flowers white or flesh-color, outer petals with saccate spur, the upper portion linear-oblong, 4 lines long, recurving or widely spreading; inner petals narrow or ligulate, abruptly expanded into a spatulate apex, contracted at base and borne on a much dilated or oblong claw as long as the blade proper.—Alpine, 9000 to 10,000 ft., localized in two widely separated regions: Salmon, Scott and Trinity mountains; Sawtooth Range, Tulare Co.

404a. Dicentra uniflora Kell.; habit x 1.

2. **CORYDÀLIS** Vent.

Stems with ample 2 or 3-pinnate leaves. Flowers in racemes. Corolla with only one of the outer petals spurred or gibbous, this becoming posterior by the torsion of the flower; petals all erect and connivent up to the engaged tips of the outer ones. Filaments with nectar-bearing process projecting into the petal-spur. Seeds with a concave aril-like crest. (Greek Korydallis, the ancient name of the crested lark.)

Flowers white or cream-color; spur 1½ to 2 times as long as the petals..... 1. *C. caseana.*
Flowers yellow; spur barely ½ as long as the petals.. 2. *C. aurea.*

1. **C. caseàna** Gray. Stem 1½ to 3 ft. high, arising from thickened roots; leaves ½ to 1¼ ft. long; leaflets ovate, mucronate, 3 to 9 lines long; raceme dense, 1½ to 3 in. long; corolla white or cream-color, with bluish tips; petals 4 to 5 lines long, the spur nearly straight, 1½ to 2 times as long.—Sierra Nevada from Nevada Co. to Plumas Co., 5000 to 6300 ft.

2. **C. aúrea** Willd. Branching from the base, spreading, about 10 in. high; leaves finely dissected; raceme few-flowered, short, the pedicels 1 to 2 lines long; flowers yellow; petals 3½ to 4 lines long, the spur about half as long; capsules terete, at length torulose, 10 lines long; seeds black, glossy.—Mono Co., 6900 to 7000 ft.; Rocky Mts. to Alas. and Nova Scotia.

Fumària L. Corolla 1-spurred; fruit indehiscent, 1-seeded; seeds not crested. F. OFFICINÀLIS L. Fumitory. Corolla flesh-color, crimson-tipped—Orchards, San Luis Obispo, Ontario and Upland; introduced from Eur.

CAPPARIDÀCEAE. CAPER FAMILY

Herbs (ours annuals) or shrubs, with heavy-scented herbage. Leaves alternate, ours palmately compound with 3 (rarely 5) leaflets, or sometimes simple. Flowers perfect in bracted racemes, or solitary and axillary. Bracts usually petioled, conspicuous or minute, even in one species. Calyx lobes or sepals 4, minute or small, much smaller than the petals, usually persistent. Petals 4, not clawed or scarcely so. Stamens 6 (in Polanisia and other genera often many), nearly equal. Ovary superior, 1 (or rarely 2) -celled, borne on a stipe and often exserted. Receptacle (torus) often thickened or lengthened between the stamens and petals. Fruit a few to many-seeded 2-valved capsule, the valves separating from the filiform placentae, or the valves separating from the axis as closed 1-seeded nutlets.

Shrub; ovary 1-celled, many-ovuled; capsule inflated; torus enlarged at summit into a circular disk.....1. ISOMERIS.

Herbs.
Ovary 1-celled; capsule few to many-seeded, its valves separating from the placentae; torus more or less thickened and sometimes lengthened.
Flowers in ours white; stamens 8 or more....2. POLANISIA.
Flowers yellow; stamens 6.
Capsule linear to oval (longer than broad)....3. CLEOME.
Capsule short, nearly as broad as long or broader, more or less flattened contrary to the replum; valves boat-like or conical..4. CLEOMELLA.
Ovary 2-celled, didymous, the cells with 1 or 2 ovules; fruit 2-seeded, each valve closely investing its seed and falling away with it; torus short.
Stamens elongated; stipe long; stipules present....5. WISLIZENIA.
Stamens little surpassing petals; stipe very short; stipules none...6. OXYSTYLIS.

1. **ISÓMERIS** Nutt.

Glaucous shrubs. Leaflets 3. Flowers large, yellow, in bracted racemes. Calyx 4-cleft, persistent. Stamens long-exserted. Capsule large, inflated, coriaceous, long-stipitate, tardily dehiscent. Seeds few, large. (Greek isos, equal, and meris, part.)

1. **I. arbòrea** Nutt. BURRO FAT. Branching, 2 to 4 ft. high; leaflets oblong, acute, ¼ to 1½ in. long; petals 6 to 8 lines long, the calyx lobes half as long; capsule elliptic-oblong to lanceolate, long-pointed or short-pointed, 1½ to 2½ in. long, on long (½ to ¾ in.) stipes.—Western Mohave Desert, s. to San Diego Co. Feb.-May. Var. GLOBÒSA Cov. Capsule globose to broadly elliptic, abruptly short-pointed, 1 to 1½ in. long.—Monterey Co. to San Diego Co. and e. to Tehachapi.

2. **POLANÍSIA** Raf.

Viscid-glandular annuals. Leaves palmately 3 to 5-foliolate. Flowers in a terminal raceme, with simple bracts. Stamens 8 to 32. Petals commonly clawed. Gland on the receptacle behind the ovary. Ovary sessile or short-stipitate. Capsule linear to oblong, many-seeded, erect, on spreading pedicels. (Greek polus, many, and anisos, unequal, referring to the stamens.)

1. **P. trachyspérma** T. & G. Erect, branching from below, 7 to 12 in. high; leaflets 3, narrowly ovate to oblanceolate, 6 to 9 lines long; petals white, obovate, strongly notched, clawed; stamens 9 to 16; capsule linear-lanceolate, turgid, 1 to 1¾ in. long.—Ne. Modoc Co.; e. to the Great Plains, n. to Wash.

3. **CLEÒME** L. SPIDER PLANT

Ours annuals. Leaflets 3, sometimes 5, entire. Flowers yellow, in racemes. Sepals distinct or united at base. Capsule oval to linear, pendulous or erect. Seeds several to many, round-reniform. (Ancient name of some European mustard-like plant.)

Calyx 4-cleft; stamens longer than petals; capsule linear, pendent; herbage glabrous.
Flowers purple....1. *C. serrulata.*
Flowers yellow....2. *C. lutea.*
Calyx of 4 distinct sepals.
Stamens much longer than petals; capsule oval or oblong, pendent; herbage viscid-pubescent....3. *C. platycarpa.*
Stamens not longer than petals; capsule linear, erect on its stipe; herbage glabrous..4. *C. sparsifolia.*

1. **C. serrulàta** Pursh. ROCKY MOUNTAIN BEE PLANT. Erect, simple or branching, 1 to 3 ft. high; leaflets 3, oblong or oblong-lanceolate, entire, 1 to 2 in. long; flowering racemes dense; calyx lobes mucronate or subulate, short, mostly shorter than tube; petals reddish purple, sometimes pinkish or white, 3 to 5 lines long; capsule linear, sometimes torulose, 1 to 2¼ in. long; pedicel about equaling stipe, pedicel and stipe together nearly to fully as long as capsule.—Pt. Sur; San Diego Co.; Ariz. to Wash., e. to Rocky Mts. June-July.

2. **C. lùtea** Hook. Similar in habit to no. 1; leaflets 3 to 5, oblong or oblong-oblanceolate, mucronate, mostly ¾ to 1½ in. long; calyx lobes triangular-acute to lanceolate, longer than tube; petals golden yellow, 3 lines long; capsule linear, ½ to 1½ in. long, of about the same length as stipe and pedicel together; stipe about equalling pedicel.—Desert region of Inyo and Mono Cos.; n. to Wash., e. to Col. May-Aug.

3. **C. platycárpa** Torr. STINK-CLOVER. Erect, 1 to 2 ft. high; leaflets 3 oval or oblong, ⅛ to 1 in. long; bracts oval or oblong, petioled; flowering raceme dense; sepals subulate; petals golden yellow, ovatish-oblong, 3 to 3½ lines long; capsule turgid, oval or oblong, 8 to 12-seeded, ½ to 1 in. long, the stipe mostly a little shorter.—Butte Co. to Siskiyou and Modoc Cos.; Ore. to w. Nev. June-Aug.

4. **C. sparsifòlia** Wats. Erect, branching, ½ to 2 ft. high, sparsely leaved; petioles ½ to 1¾ in. long; leaflets 3, obovate to cuneate, 2 to 5 lines long; flowers few in the raceme, greenish yellow, 3 to 4 lines long; sepals denticulate; pedicels 1 to 3 lines long; petals spatulate, 5 lines long, with nectar-bearing scale at base; stamens not longer than petals; capsule linear, ¾ to 1¼ in. long; stipe 1½ to 2 lines long.—Inyo Co.; w. Nev. May-June.

4. CLEOMÉLLA DC.

Annuals. Leaves with 3 leaflets. Flowers yellow. Capsule rhomboidal, few-seeded and small, pendent or spreading on a long or short stipe and pedicel, ours with the valves laterally distended or produced into short horns. (Diminutive of Cleome.)

Stipules none; herbage glabrous.
  Flowers in racemes.
    Stipe and pedicel about equal, widely spreading or the stipe sometimes a little deflexed on its pedicel.....1. *C. oocarpa.*
    Stipe almost obsolete, the pedicel elongated.....2. *C. parviflora.*
  Flowers solitary and axillary; capsule mostly deflexed on its pedicel; leaves subsessile, glabrous.....3. *C. brevipes.*
Stipules scarious-laciniate, resembling a tuft of wool; leaves long-petioled, pubescent.....
4. *C. obtusifolia.*

1. **C. oocárpa** Gray. Erect, simple or branching, 5 to 24 in. high; leaflets lanceolate or linear, ½ to 1½ in. long, the petioles as long to half as long; flowering racemes dense; petals a pale but not dull yellow, 2 lines long, exceeded by the stamens; capsule 2 lines long, the valves boat-shaped or low conical; stipe and pedicel about equal, the two together 8 to 10 lines long.—Alkaline soil, Colorado and Mohave deserts, n. to Inyo Co.; e. to Col. May-June.

2. **C. parviflòra** Gray. Mostly freely branching from near the base, 4 to 10 in. high; leaflets linear, ¾ to 1 in. long, very short-petioled; flowering raceme dense, its bracts commonly simple, sometimes similar to the leaflets and not reduced, sometimes much reduced; stamens not exceeding the (1 line long) petals; capsule deltoid, 2 lines broad, the valves gibbous or navicular, very bluntly if at all beaked; pedicels 8 to 13 lines long, the stipe 1 line long or less.—Alkaline soil, e. of the Sierra Nevada from Lassen Co. to Inyo Co., and s. throughout the Mohave Desert. May-June.

3. **C. brévipes** Wats. Diffusely branched from the base, 2 to 10 in. high; leaves subsessile; leaflets linear, 4 to 6 lines long, or the upper leaves simple and similar to the leaflets; flowers solitary in the axils of nearly all the leaves; petals obovate, ¾ line long; stamens shorter than petals; capsule 2 lines broad, broader than long, its valves produced into short but distinct horns; pedicel and stipe recurved, 1 to 2 lines long.—Alkaline shores, salt meadows or washes: Mohave Desert n. to Owens Lake and e. to western Nev. May-July. Habit suggestive of an annual Suaeda.

4. **C. obtusifòlia** Torr. & Frem. MOHAVE STINKWEED. Plants diffusely branched, 5 to 10 in. high, or the trailing stems ½ to 3 ft. long, with ascending branchlets; leaflets somewhat succulent, obovate, pubescent, 2 to 8 lines long, the apex with a mucro or hair; pedicels 3 to 4 lines long; calyx lobes ovate, pilose-ciliate; corolla bright lemon yellow or pale orange; petals oblong, hispidulose on back of blade, narrowed to a short broad claw, 2½ lines long, all 4 turned to upper side of flower or 2 of them spreading horizontally right and left; stamens raised on a torus, exserted; capsule 3 to 4½ lines broad, its valves conical, produced into a long and narrow beak; stipe in fruit 3 lines long, reflexed upon its pedicel.—Colorado and Mohave deserts, n. to Inyo Co.; e. to western Ariz. June-Aug. Doves feed on the seeds. Var. PUBÉSCENS Aven Nelson. Herbage densely pubescent with short

spreading hairs.—S. Nev. (C. pubescens Nelson.)

5. **WISLIZÈNIA** Engelm.

Erect rank-scented annuals. Leaves with 3 leaflets and with minute deciduous bristles for stipules. Flowers yellow. Stamens with long much-exserted filaments. Stipe in fruit refracted upon the pedicel. Fruit 2-seeded and didymous; each valve closely contracted upon its seed and falling away with it, therefore like a nutlet. (Dr. A. Wislizenius, who collected in early days in California.)

1. **W. refrácta** Engelm. JACKASS-CLOVER. Fig. 405. Branching, 1 to 2 (or 6) ft. high; leaflets obovate to oblong, 4 to 9 lines long, rather longer than the petiole; raceme dense, in age usually much elongated; petals 1½ lines long; stamens and ovary exserted; pods 1½ to 2 lines broad, the lobes strongly divergent and crested or toothed at apex, the cells separated by a partition with a single rather large perforation; stipe in fruit 2 to 4 lines long; style persistent and bristle-like.—Sacramento to Lathrop and s. in the San Joaquin Valley as an immigrant; native along the Colorado River, thence e. to N. Mex. A bee plant in the San Joaquin and often called Stinking Mustard because of its strong odor.

405. Wislizenia refracta Engelm.; *a*, fl. branchlet x ½; *b*, fl. x 2; *c*, capsule x 4.

6. **OXÝSTYLIS** Torr. & Frem.

Annual. Leaves with 3 leaflets, long-petioled. Flowers in head-like axillary clusters. Ovary with short stout stipe; style very long, subulate, becoming indurated and spinescent. Fruit 2-seeded and didymous, the valves separating as obovate nutlets with thin soft covering. (Greek oxus, sharp, and stulis, column or style.)

1. **O. lùtea** Torr. & Frem. Stem stout, erect, usually simple, 1 to 3 ft. high, flowering from the base; leaflets oval, ¾ to 1½ lines long; fruit little over 1 line long, fruiting style spine-like, 3 to 4 lines long—Death Valley region.

CRUCÍFERAE. MUSTARD FAMILY

Herbs with alternate leaves, no stipules and the flowers in terminal bractless racemes. Sepals and petals 4, regular and distinct. Petals commonly with claws, the blades spreading in the form of a cross. Stamens 6, commonly tetradynamous (4 long and 2 short), sometimes subequal, sometimes 4 or 2. Ovary superior, 2-celled by a thin partition stretched between the parietal placentae; style 1, stigma 2-lobed or 1. Fruit a 2-celled capsule, the 2 valves separating from below upwards, leaving behind the placentae and partition, or often 1-celled and indehiscent, or breaking up transversely into 1-seeded joints. Capsule long and narrow (a silique) or short and roundish (a silicle), commonly termed a "pod" and either terete, 4-sided, compressed (flattened parallel to the partition), or obcompressed (flattened contrary to the partition). Seeds in each cell in 1 row or 2 rows. Embryo always curved, the caulicle folded upon the back of one of the cotyledons (incumbent) or along the edge of the cotyledons (accumbent).—Herbage always with the

characteristic mustard-like or pungent juice. Some Streptanthus species have a somewhat irregular flower. Tropidocarpum has a leafy raceme.

I. Pod dehiscent by valves.

A. Pod a silique (linear-elongated to oblong, several times longer than wide).

Pods not stipitate, or on a very short or obscure stipe (½ to 1 line long).
Racemes leafless and bractless.
Pod not beaked or merely tipped with the persistent style.
Stems from annual or perennial roots or root-crowns.
Valves 1-nerved (sometimes also more or less veined.)
Seeds in 1 row in each cell (except 2 species in no. 4 and several in no. 14).
Flowers yellow; at least the stem leaves pinnatifid.
Leaves lobed; flowers small.
Pods terete; annuals.....4. Sisymbrium.
Pods somewhat quadrangular, pointed; perennial..
9. Barbarea.
Leaves entire or merely dentate, at least not lobed; flowers large, orange or yellowish..15. Erysimum.
Flowers white or whitish (rarely yellowish) to purple or purplish.
Petals with a broad limb, not crisped or twisted.
Pod teretish; flowers white or pale yellow; leaves pinnately divided into small segments; tufted perennial.....13. Smelowskia.
Pods flattened; flowers commonly rose-purple or white; leaves dentate or entire, a few species pinnately lobed or pinnatifid.
Pods not horned at apex; seeds winged or wingless.....14. Arabis.
Pods 2-horned at apex; seeds winged.....
16. Matthiola.
Petals commonly with narrow limb.
Sepals mostly greenish; petals white or yellowish, rarely purple or roseate, the blade not crisped; filaments distinct; stigma entire or obscurely 2-lobed; pods terete or nearly so; seeds not winged ..2. Thelypodium.
Sepals mostly colored, commonly purple; petals purple or white, rarely yellow, the blade often crisped, often narrower than the claw; filaments distinct or the upper 1 or 2 pairs connate; stigma entire to deeply 2-lobed; seeds winged or wingless.....
3. Streptanthus.
Seeds in 2 rows in each cell.
Pods terete; flowers yellow or white.....10. Radicula.
Pods strongly flattened; flowers purplish.....17. Parrya.
Valves not nerved; leaves pinnate or simple.....11. Cardamine.
Stems from tuberous rootstocks, naked below; flowers white..12. Dentaria.
Pods produced into a beak beyond the valves; flowers yellow, with 4 green glands; pods terete.....8. Brassica.
Racemes leafy; leaves pinnatifid; annual.....18. Tropidocarpum.
Pods on a long stipe (5 to 10 lines long); flowers yellow.....1. Stanleya.

B. Pod a silicle (globose, orbicular or oblong, little more than once, twice or thrice as long as wide).

Pods not turgid.
Pods flattened parallel to the broad partition.
Flowers in racemes; seeds not winged.
Pods 1 or 2-seeded; low altitudes.....27. Alyssum.
Pods many-seeded; seeds in 2 rows in each cell; mostly alpine or subalpine.
30. Draba.
Flowers solitary on naked scapes; seeds with a broad membranous wing.....
26. Platyspermum.
Pods flattened contrary to the narrow partition.
Seeds 2 to several in each cell.
Herbage glabrous; leaves undivided.....22. Thlaspi.
Herbage pubescent; leaves pinnately incised or parted.
Flowers white, 1 line long; pods 1 to 4 lines long.....28. Capsella.
Flowers yellowish, 6 lines long; pods 3 to 9 lines long...19. Lyrocarpa.
Seeds solitary in each cell.
Pods regularly dehiscent.
Pods with pubescent valves and cord-like margins, notched both at base and apex.....21. Dithyrea.
Pods with glabrous or pubescent valves, notched or obtuse at apex, not notched at base; winged or not winged at apex.....
24. Lepidium.

Valves of the pods falling as closed or nearly closed nutlets, very rugose.... 23. CORONOPUS.
Pods more or less turgid.
Terrestrial plants.
Pods subglobose or obovate; herbage pubescent.....20. LESQUERELLA.
Pods pear-shaped with a narrow margin; herbage glabrous or nearly so..... 29. CAMELINA.
Aquatic plants; pods oblong; leaves linear-subulate.....25. SUBULARIA.

II. POD INDEHISCENT, OR AT LEAST NOT DEHISCENT BY VALVES.

Pods elongated, breaking transversely into 1-seeded indehiscent joints.
Flowers showy; pods several-seeded, commonly with constrictions between the seeds.....7. RAPHANUS.
Flowers small; pods 2-seeded, jointed in the middle.....6. CAKILE.
Pods flattened, orbicular to obcuneate, 1-seeded, wholly indehiscent.
Pods margined all around with a wing; stems mostly erect.
Flowers in long racemes; pods orbicular.....32. THYSANOCARPUS.
Flowers crowded in rather short racemes, the racemes corymbose-paniculate; pods elliptical.....5. ISATIS.
Pods not winged; stems slender, diffuse.....31. ATHYSANUS.

1. **STÁNLEYA** Nutt.

Tall perennial glabrous herbs, or sometimes woody at base, with coriaceous leaves and large yellow flowers in elongated terminal racemes. Calyx long, cylindric; sepals spreading or reflexed. Petals oblong or spatulate with slender claws. Stamens equal; filaments long-exserted; anthers linear, curved or coiled. Stigma small, sessile, entire. Pod linear-elongated, terete, long-stipitate, its valves 1-nerved; seeds in one row; cotyledons incumbent. (Lord Edward Stanley, English ornithologist, first half 19th century.)

Petals bright yellow, the blade broader than the woolly claws.....1. *S. pinnata.*
Petals light yellow, glabrous, the blade scarcely wider than upper part of claw..2. *S. elata.*

1. **S. pinnàta** (Pursh.) Britt. Plants 2 to 3½ ft. high, the long erect branches from stout woody bases 4 to 6 in. high; leaves glaucous, variable, the lower commonly coarsely lyrate-pinnatifid or sometimes entire, 3 to 8 in. long, long-petioled, the upper less divided, or lanceolate and entire, short-petioled; pedicels 2 to 4 lines long; sepals greenish yellow; petals bright yellow, the oblong blade 2½ to 4 lines long, the claw woolly pubescent, as long or longer than blade and dilated downwards; filaments puberulent toward base; pods 1½ to 2½ in. long, a line wide, spreading, curved like a sickle; stipe 5 to 10 lines long.—Dry plains and foothills, 1000 to 4500 ft.: Mohave Desert, w. to Santa Barbara Co., n. to the upper San Joaquin Valley and Inyo Co.; e. to Neb. and Tex. It is remarkably capparidaceous in habit and in certain points of flower structure.

2. **S. elàta** Jones. Plants 2 to 6 ft. high, branching toward the top; leaves coriaceous, ovate-lanceolate, entire or sometimes with few small lobes at the base, 4 to 10 in. long, contracted at the base to a short petiole; racemes 1 to 2 ft. long; sepals petal-like, enlarged to a spatulate blade 2 lines wide; petals light yellow, of about equal length but narrower and less conspicuous; filaments woolly from the middle to the base; pods filiform, 3 to 4 in. long, ½ line in diameter.—Panamint Range; Inyo Mts.; n. to western Nev.

2. **THELYPÒDIUM** Endl.

Ours mostly coarse erect annuals or biennials. Basal leaves mostly petioled, the cauline petioled, or sessile-auriculate. Flowers white or pale yellow, rarely purple or roseate, the racemes often dense. Petals with narrow claw, the exserted limb narrow or obovate. Stamens tetradynamous, often exserted; filaments never united; anthers narrowly linear, curved. Stigma small, circular and entire or obscurely 2-lobed. Pod terete, slender, short-stipitate or sessile. Seeds oblong, somewhat flattened, not winged or scarcely so. Cotyledons incumbent. (Greek thelus, female, and pus, foot or support, the ovary more or less stipitate.)

Cauline leaves not sagittate nor auriculate-clasping; annual or biennial.
Flowers spreading in a dense spike-like raceme; fruiting racemes dense; petals white, 2¼ to 3 lines long; herbage glabrous; transmontane biennials.
Cauline leaves sessile, entire; racemes short, compact.....1. *T. integrifolium.*

Cauline leaves petioled, irregularly laciniate or entire, the upper subentire; racemes much elongated.....2. *T. laciniatum.*
Flowers in a raceme, the raceme soon lax; fruiting racemes commonly lax; annuals.
Flowers ascending; mostly Coast Ranges and coastal S. Cal.
Cauline leaves, at least the upper, sessile; flowers 4 to 5 lines long; pods ascending; herbage glabrous or nearly so.....3. *T. flavescens.*
Cauline leaves petioled or mostly petioled; flowers 1½ to 2½ lines long; herbage as if glabrous or subglabrous, but commonly with scattered hairs.
Calyx purple or purplish; pods ascending or deflexed...4. *T. lemmonii.*
Calyx green or yellowish; pods commonly reflexed or divaricate-spreading.....5. *T. lasiophyllum.*
Flowers soon reflexed; pods with a beak 1 to 3 lines long; leaves all petioled; southern deserts.....6. *T. longirostris.*
Cauline leaves sagittate- or auriculate-clasping; annuals.
Pods ascending, not torulose or scarcely so.
Raceme very dense and spike-like; n. and e. of Sierra Nevada.....
7. *T. brachycarpum.*
Raceme not dense or spike-like.
Petals spatulate, 2 times as long as the sepals; Lassen and Modoc Cos.....
8. *T. howellii.*
Petals linear-oblanceolate, 1¼ to 1½ times as long as the sepals; San Bernardino Mts.....9. *T. stenopetalum.*
Pods declined-spreading, markedly torulose; branches elongated-serpentine; deserts...
10. *T. cooperi.*

1. **T. integrifòlium** Endl. Stem simple or branched only above, 3 to 4 ft. high; basal leaves ovate-lanceolate, entire or shallowly repand-dentate, 1 to 6 in. long, drawn down into petioles nearly as long; upper leaves linear-lanceolate, sessile (the lower ones sometimes auriculate), acute, erect; flowers white, crowded in subcapitate racemes, the racemes 3 to 4 in. long, several in a terminal panicle; racemes little elongated in fruit, the pods therefore crowded; pods slender, torulose, curved upwards, 1 in. long, strongly divaricate on their (1 to 3 lines long) pedicels; stipe ¼ to ½ line long.—Moist situations, Mohave Desert; e. to Col., n. to eastern Wash.

2. **T. laciniàtum** (Hook.) Endl. Stems stout, 1¾ to 2½ ft. high; leaves deltoid-ovate to oblong or oblong-lanceolate, irregularly segmented and toothed, a little fleshy, 1¼ to 8 in. long, the petioles ½ to as long; racemes very dense, ½ to 1½ ft. long; flowers white; pods very slender, spreading or horizontally divaricate, 1¼ to 6 in. long; pedicels 1 to 2 lines long.—Valleys and foothills, Inyo Co.; n. to western Nev. and e. Ore. and Wash.

3. **T. flavéscens** (Hook.) Wats. Stem erect, 1 to 4 ft. high, simple or with several much elongated simple branches from below the middle; herbage glaucous and glabrous, or somewhat hispidulous; leaves ovate to oblong-lanceolate, irregular or somewhat erosely toothed or laciniate, sometimes with two or three pairs of broad salient lobes below the middle, 4 to 8 in. long, the lowest on petioles 1 to 1¼ in. long, the uppermost linear-lanceolate, sharply serrate or denticulate, 1 to 4 in. long, sessile; flowers pale yellow; petals usually much exceeding the sepals, the claw broad and the undulate blade narrow; ovary commonly hairy, rarely quite glabrous; pods ascending, 1¼ to 3 in. long, ¾ line wide.—Inner Coast Range valleys from Solano Co. to Monterey Co.

4. **T. lemmònii** Greene. Stems 1 to 1¾ ft. high; lower leaves oblong, repand-dentate, 2 to 5 in. long, contracted to a petiole ½ to 1 in. long; upper leaves lance-linear, attenuate at both ends, sessile; sepals purple with broad white margins; petals pale purple with deeper veins, cuneate-oblong, narrowed below to a short claw; anthers yellow or purple; pods slender, 2 to 2¼ in. long; pedicels a little hairy.—Inner South Coast Range from w. Fresno Co. to s. San Luis Obispo Co. (Caulanthus anceps Payson.)

5. **T. lasiophýllum** (H. & A.) Greene. Fig. 406. Stem erect, simple or branching above, 1 to 5 ft. high; herbage hispid with scattered hairs or nearly glabrous above; lower leaves sinuately pinnatifid with mostly acute denticulate or entire segments, 2 to 10 in. long, the upper lanceolate, less lobed or merely denticulate, all petioled, or the upper rarely sessile; raceme very densely flowered, much elongated in fruit; flowers white, yellowish, or sometimes roseate; pedicels 1 line long; sepals oblong, scarcely the length

of the narrow petals; pods straight or somewhat curved, at first spreading, soon strictly deflexed, 2 to 4 in. long, ¼ to ½ line wide.—Open foothills, 50 to 2000 ft.: coastal S. Cal.; Coast Ranges and their bordering plains, mostly toward the interior; n. to Wash. Apr. Var. INALIÉNUM Rob. Pods slender, erect or spreading.—Solano Co. to San Luis Obispo Co. Var. RÍGIDUM Rob. Plant rigid, often glabrous; pods stout, rigid, divaricate or deflexed-spreading; pedicels ½ line long.—Glenn Co. to e. Contra Costa Co. Var. UTAHÉNSE Jepson n. comb. Leaves thin, the lobes rounded (mostly acute in the species).—Colorado and Mohave deserts; e. to Utah. (T. utahensis Rydb.)

406. Thelypodium lasiophyllum Greene; *a*, *b*, types of basal leaves x ¼; *c*, upper leaf x ¼; *d*, infl. x ⅛; *e*, fr. branch x ⅛.

6. **T. longiróstris** (Wats.) Jepson n. comb. Stems much-branched, 1 to 1½ ft. high; leaves lanceolate to linear-lanceolate, the lower repand-dentate, the upper entire, all contracted to a short petiole, the whole 1 to 2½ in. long; flowers 2 to 2½ lines long, soon reflexed, borne on slender pedicels ½ to 1 line long; sepals green, or somewhat purplish-tinged, scarious-margined; petals pale yellow or pinkish, narrow, blade very short, narrower than the expanded summit of the claw; pods curved or straight, divaricate or deflexed, nerved, 1 to 1½ in. long, ¼ to ½ line wide, tapering to a beak 1 to 3 lines long; seeds winged.—Mohave and Colorado deserts, n. to Monterey Co. and to Inyo Co. (Streptanthus longirostris Wats. Streptanthella longirostris Rydb.)

7. **T. brachycárpum** Torr. Stem erect, simple or branched, stoutish, 1½ to 3 ft. high; herbage glabrous or sparsely hirsute below; cauline leaves narrow-lanceolate, mostly entire, sagittate-clasping, 1 to 2½ in. long, the basal oblong or oblanceolate, sinuate-toothed or pinnatifid, 1 to 4½ in. long, on petioles half as long; racemes spike-like, very dense; pedicels in fruit 1 to 1½ lines long; flowers white, 2½ to 3 lines long; petals linear, nearly twice as long as the sepals; stamens exserted; pods slender, somewhat knotted, sharply beaked, ascending, 6 to 12 lines long, in age spreading.—Mountain sides and valleys, 4800 to 7200 ft., north end and east slope of the Sierra Nevada from Siskiyou Co. to Inyo Co.; e. to Nev. May-Aug.

8. **T. howéllii** Wats. Biennial; stem simple or branching, erect, 1½ to 2½ ft. high; herbage glabrous and glaucous, or hirsute near the base; basal leaves entire or repand, with the winged petiole toothed; cauline leaves linear to lanceolate, sagittate-clasping, erect, ¾ to 2½ in. long; flowers white, flesh color or purple, 3½ to 4½ lines long; sepals saccate, oblong, acuminate, white-margined, the lateral pair strongly hooded or horned at apex; petals narrowly linear with crisped limb; stamens with the filaments of the 2 longer pairs connate; anthers sagittate, strongly curled after anthesis; pods slender, nearly erect, 1 to 2 in. long, tipped by the rather slender style ½ line long.—Valley meadows, Lassen and Modoc Cos.; n. to eastern Ore.

9. **T. stenopétalum** Wats. Stem simple or branching from the base, 1 to 2 ft. high; herbage glabrous and glaucous; leaves oblong to lanceolate or

linear, auriculate-clasping, 1 to 2 in. long, the basal obovate, scarcely petioled; flowers narrow, 4 to 5 lines long; petals white or pinkish, narrow-oblanceolate, little exserted; pods slender, ascending, 1¾ to 2¼ in. long. —**Stony slopes, San Bernardino Mts., 6500 ft.**

10. **T. coóperi** Wats. Stem slender, simple, flexuous, 8 to 14 in. high, or branched and developing elongated tortuous or even serpentine branchlets, the whole 2 to 3 ft. long; herbage glabrous; leaves disappearing early, oblong-obovate to linear-oblong or linear-lanceolate, mostly entire, the cauline sagittate-clasping, the basal contracted to a short petiole, the whole 1 to 2½ in. long; flowers narrow, 3 to 4 lines long; sepals greenish, turning purplish; petals yellow, aging white with purple center, about 1½ times as long as the sepals; pods terete, torulose, especially on upper half, commonly falcate, attenuate at apex, glabrous, widely divaricate, ¾ to 1 in. long; style 1 to 1¼ lines long; pedicels ½ to 1 line long.—Desert mesas: Inyo Co. s. through the Mohave Desert to the Colorado Desert; e. to Ariz. Apr.

3. **STREPTÁNTHUS** Nutt.

Annual herbs, or some biennial or perennial. Basal leaves commonly toothed or pinnatifid, the cauline similar or entire, often sagittate-clasping. Calyx with 2 of the sepals or all saccate at base, the calyx thus ovoid or broad at base and contracted above, or by the spreading of the tips becoming somewhat flask-shaped; or not at all saccate and quite subcylindric. Petals purple, white or pinkish, rarely pale yellow, commonly with a narrow undulate or crisped limb and channeled claw, the upper pair sometimes longer (as in no. 21). Stamens tetradynamous, or in 3 unequal pairs, the filaments all distinct, or the longer pairs united, or only the uppermost pair united. Pod narrowly linear, flattened parallel to the partition (rarely obcompressed) or terete; valves 1-nerved or rarely carinate. Seeds in 1 row, flat, winged or wingless. (Greek streptas, twisted, and anthos, flower, in reference to the petals.)

A. Stigma 2-lobed; petals plane or somewhat crisped; stem erect, simple or branched, seeds mostly wingless, sometimes narrowly winged.

Pods terete or slightly compressed.
- Cauline leaves petioled; filaments of equal length, all distinct; perennials (or no. 1 biennial).—Subgenus CAULANTHUS.
  - Stem commonly branching, leafy up to the inflorescence.
    - Leaves coarsely toothed or pinnatifid; petals little exceeding the sepals; herbage glabrous above, below densely hairy. . . . . 1. *S. pilosus.*
    - Leaves entire; petals nearly twice as long as the sepals; herbage glabrous. . 2. *S. glaucus.*
  - Stem naked above the base or bearing a few reduced or bract-like leaves; lowest leaves mostly lyrate-pinnatifid; herbage glabrous.
    - Calyx densely white-woolly; stem simple, strongly inflated. . . . . 3. *S. crassicaulis.*
    - Calyx glabrous; stems 1 or several from the base, simple. . . . . 4. *S. major.*
- Cauline leaves sessile, auriculate-clasping; filaments in pairs, of unequal length; annuals.—Subgenus PARACAULANTHUS.
  - One or 2 pair of filaments connate.
    - Filaments of 2 pairs of stamens connate; pods erect; stem inflated or very succulent. . . . . 5. *S. inflatus.*
    - Filaments of 1 pair of stamens connate; stem not inflated.
      - Pedicels glabrous; pods erect. . . . . 6. *S. lemmonii.*
      - Pedicels hairy; pods reflexed or reflexed-spreading. . . . . 7. *S. coulteri.*
  - Filaments all distinct.
    - Pedicels glabrous; raceme with few remote flowers; flowers purplish. . . . . 8. *S. amplexicaulis.*
    - Pedicels hirsute; raceme with several flowers; flowers yellowish. . . . . 9. *S. simulans.*

Pods strongly obcompressed, sword-like; filaments all distinct; cotyledons trifid; annuals.—Subgenus STANFORDIA. . . . . 10. *S. californicus.*

B. Stigma circular and entire or only shortly 2-lobed; petals commonly with channeled claw, the blade crisped, usually narrow.

Filaments all distinct; annuals (except no. 14 and one var. in no. 15), all erect, or sometimes diffuse in nos. 15 and 16.—Subgenus PLEIOCARDIA.
- Plants hispid; leaves linear to oblong, the lobes or teeth commonly salient. . . . . 11. *S. heterophyllus.*

Plants glabrous and glaucous.
Branches of inflorescence without bracts; cauline leaves auriculate-clasping; sepals dull purplish or green, apex slightly bearded; petals with ovate claw contracted to a ligulate blade; stamens nearly equal; pedicels less than 3 lines long.
Flowers 3 to 4 lines long; pods 1 line broad.
Cauline leaves oblong to lanceolate, acute, with auriculate base, not crowded ..... 12. *S. campestris.*
Cauline leaves cordate, crowded on the stem ..... 13. *S. barbatus.*
Flowers 5 to 6 lines long; pods 2 lines broad; lower leaves broadly spatulate-obovate; the cauline oblong-ovate ..... 14. *S. cordatus.*
Branches of inflorescence bearing round- to lanceolate-cordate bracts; petals with expanded blade; stamens in 3 unequal pairs.
Lower leaves oblong-spatulate, crenately toothed or lobed; mostly montane.
Pods recurved-spreading; plants ⅓ to 3 or 4 ft. high; common, of wide range ..... 15. *S. tortuosus.*
Pods erect; plants 2 to 7 in. high; rare and local ..... 16. *S. gracilis.*
Lower leaves pinnately divided, the segments linear-filiform ..... 17. *S. diversifolius.*
Filaments of upper pair of stamens connate, bearing reduced anthers; inflorescence nonbracteate; petals with linear obtuse crisped blade; erect annuals.—Subgenus EUCLISIA.
Plants glabrous and often glaucous.
Leaves broad; pods torulose ..... 18. *S. breweri.*
Leaves narrow; pods not torulose.
Calyx with the sepals in pairs, the outer pair sub-orbicular with upper sepal banner-like, exceeding other flower parts, the inner or lateral pair, ovate, acute ..... 19. *S. polygaloides.*
Calyx with the 3 upper sepals approximate or connivent at tips, and lower, free ..... 20. *S. niger.*
Plants hispid, at least below.
Calyx commonly glabrous.
Racemes loose; 3 upper sepals approximate or connivent at tips, the lower free ..... 21. *S. glandulosus.*
Racemes dense, secund; 2 upper sepals approximate or connivent ..... 22. *S. secundus.*
Calyx more or less hispid, with sepal tips distinct and free.
Plants 5 to 12 in. high; raceme ending in a purple spot; leaves oblong-lanceolate ..... 23. *S. insignis.*
Plants 3 to 5 in. high; raceme without terminal spot; leaves obovate ..... 24. *S. hispidus.*

1. **S. pilòsus** (Wats.) Jepson n. comb. Stems 1¾ to 3½ ft. high; leaves pinnately parted into ovate or oblong lobes (the lobes irregularly lobed or toothed), 1¼ to 5 in. long, the petioles about half as long; raceme lax; flowers 4 to 5 lines long; sepals elliptic, green or purple, white-membranous-margined; petals whitish, scarcely exserted; pods slender, flexuous, ascending or widely divaricate, 2½ to 5 in. long; pedicels 2½ to 4 lines long.—Sandy soil, deserts: Inyo Co.; e. to Nev., n. to Ore. and Ida. Apr.-May. (Caulanthus pilosus Wats.)

2. **S. glaúcus** (Wats.) Jepson n. comb. Stems stout, branching, 1 to 1½ ft. high; leaves orbicular to roundish obovate or ovate, entire or subentire, ¾ to 3½ in. long, the upper lanceolate, all on petioles ⅓ to ⅔ as long; flowers 5 to 5½ lines long; sepals elliptic, ½ as long as the oblong obtuse petals; pods slender, 3 to 6 in. long, on pedicels 3 to 5 lines long.—Rocky slopes in the desert, 5000 to 7500 ft.: White Mts.; e. to Nev. (Caulanthus glaucus Wats.)

3. **S. crassicaúlis** Torr. Stems simple, strongly inflated, 1½ to 3¼ ft. high, the leaves mainly in a basal tuft, the cauline few and reduced; leaves ovate or oblong and obtuse to lanceolate and acute, entire above, but with 1 or 2 pair of salient oblong or linear lobes at or towards the base, 1 to 3 in. long, the petioles 1 to 1½ times as long, sometimes bearing one or two supplementary leaflets; flowers 5 to 7 lines long, spreading on pedicels ½ to 1 line long; calyx densely white-woolly, sometimes glabrate in age and then purple; petals dark purple, white-margined; pods slender, ascending, 3½ to 4¾ in. long.—Desert gulches or gravelly slopes, 5000 to 7500 ft.: Inyo Co.; e. to Utah. May-June. (Caulanthus crassicaulis Wats.)

4. **S. màjor** (Payson) Jepson n. comb. Stems 1 or few from a leafy-tufted perennial root-crown, simple, 1 to 2 ft. high; the cauline leaves few and reduced or almost none; leaves oblong to lanceolate, mostly obtusish, entire

407. Streptanthus inflatus Greene; *a*, habit x ⅙; *b*, fl. x 1½; *c*, petal x 2; *d*, pod x ¾.

obtuse or merely subacute, entire or denticulate, sessile-auriculate, 1½ to 5 in. long; racemes at first very dense; pedicels glabrous or hispid, 2 to 4 lines long; flowers ascending, spreading or almost horizontal, at first deep purple, becoming white; sepals glabrous or nearly so; stamens exserted a little; pods 2 to 4¼ in. long, ascending or erect.—Dry hills: Mohave Desert; n. to western Fresno Co. Mar.-May. (Caulanthus inflatus Wats.)

6. **S. lemmônii** (Wats.) Jepson n. comb. Stems 1 to 1⅔ ft. high; herbage glabrous; leaves ovate to lanceolate, cordate-clasping, entire or only obscurely denticulate, 1¼ to 3¼ in. long, the basal oblong-oblanceolate, coarsely toothed to entire; flower buds deep purple; raceme rather loose, the flowers deflexed or pendulous on pedicels 2 to 4 lines long; flowers 5½ to 6½ lines long; petals dark-purple-veined; pods erect, stout, 2 to 4 in. long; stigmas spreading conspicuously.—Rocky banks, San Luis Obispo Co. (S. parryi Greene.)

7. **S. còulteri** (Wats.) Greene. Fig. 408. Stems simple or branching, 1 to 3 ft. high; herbage thinly hispid; leaves oblong to ovate or lanceolate, pinnately parted or lobed to dentate or entire, sagittate-clasping, 1 to 2½ in. long, the basal on short winged petioles; racemes at first with a terminal black spot (consisting of the crowded black-purple flower

above, but with 1 or 2 pairs of lobes at base, or merely dentate, or wholly entire, 1 to 2 in. long, on petioles about as long; flowers glabrous, ascending, 5 to 6 lines long, on pedicels ½ line long; calyx blue-purple; petals whitish, dark-purple-veined; pods erect, 3½ in. long.—Desert slopes of ranges in and bordering the Mohave Desert; e. to Utah. (Caulanthus major Payson.)

5. **S. inflàtus** (Wats.) Greene. Fig. 407. Stem very stout, becoming strongly hollow-inflated, 1 to 2½ ft. high; herbage glabrous (rarely a little hispid at base); cauline leaves erect, oblong-ovate to elliptic or oblong,

408. Streptanthus coulteri Greene, *a*, portion of leafy stem x ⅔; *b*, fl. branchlet x ⅔; *c*, fl. x 1⅓.

buds), soon becoming elongated and lax; flowers 6 to 7 lines long, spreading or pendulous, on pedicels 1 to 2½ lines long; pedicels and calyx more or less bristly; calyx at first deep purple, becoming greenish; petals white with dark veins, widely spreading; filaments of longest pair of stamens united about ½ or ¾ their length; pods stoutish, reflexed or reflexed-spreading, 2½ to 3 in. long.—Interior foothills, 1000 to 4000 ft.: Madera Co. to n. Los Angeles Co. (Caulanthus coulteri Wats.)

8. **S. amplexicaúlis** (Wats.) Jepson n. comb. Stem very slender, a little flexuous, 7 to 12 in. high; leaves broadly obovate to elliptic-oblong, shallowly sinuate-dentate and obtuse, or the upper entire and acute, auriculate- or cordate-clasping, 1 to 3½ in. long, the lowest somewhat narrowed at base or subpetiolate; flowers few and remote in the raceme, purplish, ascending; pedicels 3 to 6 lines long, spreading; pods 3 in. long.—San Bernardino and San Antonio mountains, n. to Antelope Valley, 1500 to 8500 ft. May-June. (Caulanthus amplexicaulis Wats.)

9. **S. símulans** (Payson) Jepson n. comb. Stems simple or branching from the base, 1 to 1¾ ft. high; herbage hispid below, glabrous above or with a few scattering hairs; basal leaves obovate to oblong-oblanceolate, dentate, ¾ to 1½ in. long, scarcely petioled, the cauline linear-oblong or lanceolate, dentate, sagittate-clasping; flowers yellowish, 4 lines long; pedicels hispid, ½ to 1½ lines long; pods reflexed, 1¾ to 2 in. long.—San Jacinto Mts. to Balcan Mts. (Caulanthus simulans Payson.)

10. **S. califórnicus** (Wats.) Greene. Stems branching from the base, 8 to 9 in. high; herbage glabrous (or with a few scattered bristles below); leaves oblong to oblong-ovate, cordate-sessile, dentate, 1 to 1¼ in. long; pedicels hispidulose, 1 to 3 lines long; flowers pendulous, 3 to 4 lines long; sepals purple-tipped, white membranous below; petals white, purple-veined; pods obcompressed and strongly flattened, somewhat sword-like, erect or pendulous, 1 to 1½ in. long; style 1 to 1¾ lines long.—Plains at the head of the San Joaquin Valley and neighboring foothills. Mar.-Apr. (Stanfordia californica Wats.)

11. **S. heterophýllus** Nutt. Stems usually simple, 1¼ to 2¼ ft. high; herbage hirsute; leaves 1½ to 3½ in. long, oblong or linear to lanceolate, dentate with triangular or subulate teeth, or pinnately and shallowly lobed, the lobes linear to oblong, usually remote and often salient, the uppermost sometimes entire, all sagittate-clasping except the basal; flowers 2½ to 3½ lines long; calyx greenish to dark-purple, the petals white, dark-purple-veined; pedicels 2 to 4 lines long; pods abruptly reflexed, 2 to 2¾ in. long, somewhat 4-angled; style ½ line long.—Coastal foothills from Santa Barbara Co. to San Diego Co.

12. **S. campéstris** Wats. Stem 2 to 4 ft. high; leaves oblong, irregularly dentate or denticulate, the teeth setose-tipped, contracted at base to a winged petiole, 5 to 6 in. long; cauline leaves oblong to lanceolate, auriculate-clasping; flowers darkish purple, 4 to 5 lines long; sepals bristle-tipped; pods spreading and curved, 3 to 6 in. long, 1 line broad.—Montane, 4000 to 5000 ft.: San Jacinto Mts. to the Cuyamaca Mts. Var. BERNARDÌNUS Johnston. Leaves thickish, spatulate-obovate, contracted to a short petiole, 1 to 1½ in. long, entire, not ciliate nor setose; flowers pale white, 3 lines long.—San Bernardino Mts. (Agianthus bernardinus Greene.)

13. **S. barbátus** Wats. Stems simple, erect, 1½ to 2 ft. high; leaves cordate, sessile and clasping, obtuse, all similar and nearly equal, crowded, 5 to 9 lines long; flowers purple, 3 to 4 lines long; sepals obtusish, setosely bearded near the apex; pods spreading, curved, 1¼ to 2 in. long, 1 line wide; pedicels 1 line long.—Sandy bottoms, upper Sacramento River.

14. **S. cordátus** Nutt. Stems stout, arising from a simple or branched root-crown, 10 in. to 3 ft. high; basal leaves broadly spatulate-obovate, denticulate or dentate, especially toward the summit, and often setose-ciliate, ½ to 1½ in. long, on petioles ¼ to as long; cauline leaves cordate-ovate to -oblong, mostly obtuse and entire, sessile, 1 to 2¼ in. long; flowers 6 lines long; petals 1½ times as long as the sepals, with ovate claw contracted above to

409. Streptanthus tortuosus var. orbiculatus Hall; *a*, fl. branchlet x½; *b*, fl. x 2.

a ligulate blade; pods ascending or spreading, 2 to 3¼ in. long, 1½ to 2 lines broad; pedicels short (2 to 4 lines long).—Mountain valleys and slopes, Plumas Co. to Modoc Co.; e. to Col.

15. **S. tortuósus** Kell. Stems 1 to 4 ft. high, sometimes reduced and 3 to 6 in. high; lower leaves obovate to spatulate-obovate, ½ to 1 in. long, contracted at base to a petiole as long, upward becoming oblong- to ovate- or orbicular-cordate, entire, sessile and clasping, mostly ¼ to 1¾ in. broad; sepals purplish, connivent; petals rose-purple or white and purple-veined, 2½ to 6 lines long; pods recurved-spreading, 1½ to 4¾ in. long, 1 line wide.—Montane, 2000 to 7000 ft.: Sierra Nevada from Tulare Co. to Shasta Co., thence s. in the outer and middle Coast Ranges to Monterey Co. Var. OBLÓNGUS Jepson n. var. Stem tall (2 to 3 ft. high), openly branched; leaves of the main stem long-oblong, 1⅓ to 3¾ in. long.—W. Siskiyou Co. to n. Trinity Co. (Burnt Ranch, Tracy 6099, type). Var. SUFFRUTÉSCENS Jepson n. comb. Coarse biennial 1 to 2 ft. high, the stems half-woody at base.—Hood's Peak Range; Sierra foothills in Calaveras Co. (S. suffrutescens Greene). Var. FLAVÉSCENS Jepson n. var. Flowers yellow.—Sawtooth Range (Coyote Pass trail, Jepson 982, type). Var. ORBICULÀTUS Hall. Fig. 409. Stems many from the base, 3 to 6 or 9 in. high; herbage glabrous and glaucous; flowers smaller (2½ to 4 lines long), darker purple.—High montane, 7000 to 10,500 ft.: Sierra Nevada; high North Coast Ranges from Humboldt Co. to Siskiyou Co. (S. orbiculatus Greene.)

16. **S. grácilis** Eastw. Stem simple or with delicate branches from near the base, 2 to 7 in. high; lower leaves orbicular to spatulate, sinuate-dentate to pinnately lobed, 2 to 6 lines long, on petioles 1 to 3 times as long; upper cauline leaves mostly sessile, oblong to ovate, toothed or entire, auriculate-clasping, 2½ to 6 lines long; racemes 1 to 3 in. long, bearing below 1 or 2 small ovate sessile bracts (1½ to 2 lines long); flowers 3½ to 4 lines long; sepals rose-purple, the tips membranously margined, spreading; petals lavender-purple to pink, with slender claw exserted, the blade broad, purple-veined; upper pair of filaments longest; pods erect, slender, 1½ to 2 in. long.—Disintegrated granite, 10,000 ft., region of the Kings-Kern divide, Sierra Nevada.

410. Streptanthus diversifolius Wats.; *a*, habit x ⅓; *b*, fl. x 2; *c*, pod x ½.

17. **S. diversifòlius** Wats. Fig. 410. Stem erect and slender, branching above, 10 to 22 in. high; cauline leaves very narrowly linear, pinnately divided into a few remote narrowly linear or filiform segments, or sometimes linear and entire; bracts of the inflorescence broadly cordate, long caudate at apex, ½ to 1½ in. long; sepals pale with short recurved tips; petals yellow, white or pinkish, 3 to 4 lines long, the blade orbicular; anthers long, sagittate; pods reflexed, about 3 in. long, ⅔ line broad; pedicels ½ to 2 lines long.—Sierra Nevada foothills, 1000 to 4700 ft., from Amador Co. to Tulare Co.

18. **S. bréweri** Gray. Fig. 411. Stems branching from near the base, ⅔ to 2 ft. high; leaves broadly ovate and acute to narrowly lanceolate, denticulate or entire, sessile, 1 to 2½ in. long, the lowest broadly spatulate to cordate-orbicular, with a short winged petiole; flowers 3 to 5 lines long, erect, short-pediceled; sepals acuminate, the tips slightly spreading; upper petals white or delicately veined with purple, the lower dark-purple-veined or dark-purple tipped with white; upper pair of filaments connate, dark purple, conspicuous; pods ascending, slightly curved, torulose, 1½ to 2½ in. long, ½ line wide.—Middle and inner Coast Ranges: Lake Co. to San Benito Co.

411. Streptanthus breweri Gray; habit x ¼.

19. **S. polygaloides** Gray. Stem slender, simple or branched, 1 to 3 ft. high; leaves filiform, entire, some sagittate-clasping; flowers very shortly pediceled, yellowish or purple, 3 lines long; calyx very broad; upper and lower sepals suborbicular, mucronate, unequal, the broad upper sepal resembling the banner in a papilionaceous flower; lateral sepals lanceolate, acuminate; petals with expanded claw and narrowed blade, the lower 3 spreading, the upper one erect; stamens in 3 unequal pairs; upper pair of filaments connate to the summit, exserted, bearing small but pollen-bearing anthers; pods 1 to 1½ in. long, ½ line wide, at length reflexed.—Sierra Nevada foothills, 2000 to 3000 ft., from Nevada Co. to Mariposa Co. (Microsemia polygaloides Greene.)

20. **S. niger** Greene. Similar to no. 21; stem stout, 1½ to 3 ft. high; leaves linear; racemes loose, flexuous; pods ascending, 1 to 2 in. long, on pedicels 6 to 12 lines long.—Hills at Tiburon, Marin Co. Apr.

21. **S. glandulòsus** Hook. Jewel Flower. Stem nearly simple or with ascending branches from an erect axis, 1 to 2 ft. high; herbage more or less hispid; lower leaves oblanceolate, coarsely and often saliently toothed, at least the basal slender-petioled, the upper lanceolate to linear, toothed or entire, sessile and auriculate-clasping, the teeth callous-tipped; flowers 5 to 6 lines long; calyx commonly deep purple, 3 upper sepals approximate or connivent at tips, the lower one free from the others and usually spreading; petals purple, or white with conspicuous purple veins, the upper pair commonly longer and darker; claws broad, the blades curved-spreading; longest pair of filaments often connate for their entire length and with reduced anthers; pods curved, more or less spreading, glabrous or hispid, 2 to 3 in. long, 1 line wide; pedicels 4 to 4½ lines long; seeds narrowly winged.—Middle altitudes in the Coast Ranges from Sonoma and Solano Cos. to San Luis Obispo Co. Var. álbidus Jepson n. comb. Stems very stout; herbage

412. S. secundus Greene; fl. branchlet x ⅔.

glabrous and glaucous above, some scattered pubescence only below; raceme strictly bilateral; sepals white-margined and -tipped, purplish below; petals with conspicuous crisped blade, white with purplish veinlets; pods erect, stout.—Foothills of Santa Clara Valley. Var. PULCHÉLLUS Jepson n. comb. Stem generally branching, 4 to 12 in. high; herbage pubescent throughout; leaves oblong-linear to oblong-lanceolate, with opposite salient teeth; raceme often subsecund; pedicels hairy, 1 to 2 lines long; sepals commonly very slightly hispid; pods commonly a little hispid, at least the lower ones.—Dry ridges, Marin Co. (S. pulchellus Greene.)

22. **S. secúndus** Greene. Fig. 412. Stems 10 to 16 in. high; herbage similar to no. 21; racemes rather dense, secund; calyx as if 2-lipped, the 2 upper sepals approximate and larger than the 2 lower; petals white; seeds wingless.—Lower mountain slopes, Marin Co. to Lake Co.

23. **S. insígnis** Jepson n. sp. Branching from the base, ⅓ to 1 ft. high; herbage bristly-pilose; raceme with a conspicuous dark purple spot or tuft formed by the elongated calices of sterile flowers; pedicels hispid, 1 to 2 lines long; flowers 4 to 5 lines long, similar to no. 21; calyx with scattered short bristles; stigma evidently 2-lobed; pods bristly-hispid, erect or reflexed.—Stony mt. slopes, inner South Coast Range in San Benito, Monterey and w. Fresno Cos. (Warthan, A. Eastwood, type.)

24. **S. híspidus** Gray. Dwarfish, hispid throughout, branching, 3 to 6 in. high; leaves obovate, coarsely toothed, all sessile except the very lowest, ½ to ¾ in. long, the basal crowded; raceme sub-secund; sepals hispid with brownish hairs; petals purplish with white margins, 3 to 4 lines long; pods erect or ascending, very hispid, 1½ to 3 in. long, 1 line wide, the pedicels ½ to 1 line long.—Summits of the inner South Coast Range peaks: Mt. Diablo; Mt. San Carlos.

4. SISÝMBRIUM L.

Erect annuals with pinnatifid or finely dissected leaves, the base not clasping or auriculate. Flowers small (⅔ to 1 line long), yellow. Sepals oblong or linear, equaling or exceeding the claws of the petals. Pod linear or oblong, terete or nearly so, the valves more or less distinctly 3-nerved; stigma sessile or the style very short. Cotyledons incumbent. (Greek sisumbrion, the ancient name of some plant of this family.)

Pods subulate, closely appressed; seeds in 1 row; leaves pinnatifid.....1. *S. officinale.*
Pods spreading.
  Pods elongated-linear or thread-like, 2 to 4 in. long; seeds in one row; leaves pinnately parted, dimorphic, the lower with broad lobes, the upper with filiform lobes; plants very rigid in age.....2. *S. altissimum.*
  Pods ⅛ to 1¼ in. long; leaves pinnate or bi- or tri-pinnate, not dimorphic on one plant.
    Seeds in 1 row.
      Leaves bi- or tri-pinnately dissected, with linear or linear-lanceolate segments; pods 9 to 15 lines long.....3. *S. sophia*
      Leaves pinnate with oblong pinnatifid segments; pods (1½ or) 4 to 8 lines long.....4. *S. incisum.*
    Seeds in 2 rows.
      Leaves with finely dissected segments; pods glabrous, 2 to 5 lines long.....5. *S. pinnatum.*
      Leaves with oblong pinnatifid segments; pods sparsely pubescent, 7 to 9 lines long.....6. *S. cumingianum.*

1. **S. officinàle** (L.) Scop. HEDGE MUSTARD. Stem rigid, 1 to 4 ft. high, with divaricate branches above; herbage a little rough-hispid; leaves lyrately and often somewhat runcinately pinnatifid or pinnately parted with dentate or coarsely toothed segments, petioled, the lowest rosulate and 4 to 10 in. long; pods terete, 6 lines long, tapering from base to summit, nearly sessile, closely appressed to the axis in a long slender raceme.—Very common weed of waysides and waste places; nat. from Eur. Apr.-May.

2. **S. altíssimum** L. TUMBLING MUSTARD. Stems erect, much branched, 2 to 3 ft. high; herbage nearly glabrous or sparsely hirsute below; lower leaves large, petioled, the lobes ¼ to 1 in. broad, entire or dentate; upper leaves reduced, with linear or filiform segments; pods spreading, linear or subfiliform, 3 to 4 in. long, on stout pedicels.—Introduced European weed, established in widely scattered localities throughout the state. The difference between the broad lobes of the basal leaves and the filiform divisions of the upper leaves is very striking.

3. **S. sòphia** L. FLIX-WEED. Stem branching above the base, 1¼ to 1¾ ft. high; herbage finely pubescent with branched hairs; leaves finely bi- or tripinnately dissected, the segments linear or lance-linear, ½ to 1½ lines long; pedicels filiform, spreading, 3 to 5 lines long; pods ascending, narrowly linear, ¾ to 1¼ in. long; seeds in 1 row.—European weed, introd. in Siskiyou and Modoc Cos.; rare with us.

4. **S. incìsum** Engelm. Fig. 413. Stems 1 to 2½ ft. high; herbage stellate-puberulent, obscurely glandular; leaves thin, pinnate (or the upper leaflets not distinct); leaflets incised-pinnatifid, 3 to 14 lines long; pods 6 to 8 lines long, straight or upwardly curved, exceeding the spreading pedicels; seeds in 1 row (sometimes indistinctly in 2 rows); pods with a distinct style (¼ to ⅔ line long).—Montane, 7000 to 11,500 ft.: San Bernardino Mts.; Sierra Nevada from Tulare Co. to Placer Co.; Yollo Bolly Mts.; e. to Tenn., n. to Saskat. Var. SÓNNEI Rob. Pods 3 lines long, on pedicels about as long.—Montane, Nevada Co. to Sierra Co. Var. HARTWEGIÀNUM Wats. Pods shorter, 1½ to 2 lines long, on somewhat appressed or nearly erect pedicels.—East slope or easterly areas of the Sierra Nevada in Tulare and Inyo Cos.; White Mts.; e. to Col., n. to B. C., s. to Mex.

413. Sisymbrium incisum Engelm.; *a*, leaf x ½; *b*, infl. x ½; *c*, fl. x 3; *d*, pod x 2; *e*, dehiscent pod x 2.

414. Sisymbrium pinnatum Greene; *a*, habit x ½; *b*, fl. x 3; *c*, pod x 2; *d*, dehiscent pod x 2.

5. **S. pinnàtum** (Walt.) Greene. TANSY MUSTARD. Fig. 414. Stem ¾ to 2 ft. high; herbage ashy-tomentulose or puberulent, sometimes glabrate and green; leaves pinnately or bipinnately dissected; segments elliptic to linear-oblong, ¼ to 1 line long; pods oblong to linear, acute at each end, 2 to 5 lines long, shorter than the slender spreading or divaricate pedicels; seeds in 2 rows; style very short (⅓ line long) or almost

none.—Desert or arid slopes and mesas, 1250 to 8500 ft.: n. end and e. slopes or summits of the Sierra Nevada, head of the San Joaquin Valley, s. to the Mohave and Colorado deserts, thence west to cismontane S. Cal.; more common southward in our range than northward; e. to Va.

6. **S. cumingiânum** F. & M. Closely resembling stout forms of S. incisum; stem stouter, simple, 3½ ft. high, pubescent with short branched hairs; leaves densely canescent-tomentose; pods narrow, abruptly pointed, sparsely pubescent with branched hairs, 7 to 9 lines long; seeds in 2 rows, tightly compressed. —Mohave and Colorado deserts, and bordering southerly or westerly ranges.

5. ÍSATIS L.

Ours a biennial or perennial herb. Flowers small, yellow, the racemes crowded in small panicled corymbs. Pod 1-celled, 1-seeded, indehiscent, winged and strikingly like a samara or ash fruit. (The classical name).

1. **I. tinctòria** L. Dyers Woad. Stems branching from or near the base, 1 to 2 (or 3) ft. high; herbage somewhat glaucous, glabrous or the lower leaves sparingly ciliate along the midrib; basal leaves oblong-ovate to lanceolate, entire or remotely serrate, 3 to 4 in. long, on petioles nearly as long; cauline leaves sessile, sagittate at base; flowers 1 to 1½ lines long; stigma broad, sessile; pods 4 to 7 lines long on slender pedicels, erect at first but eventually pendent, becoming dark purple at maturity.—European plant, naturalized in Siskiyou Co., a troublesome pest in Scott Valley, springing up from the root when cut down; known as Marlahan Mustard.

6. CAKÌLE L.

Maritime branching annual with fleshy leaves and rather small purplish or white flowers. Pod fleshy, or when ripe, dry and corky, 1-celled, jointed in the middle, the 2 joints 1-seeded, the upper joint at length deciduous, the lower one persistent. Cotyledons accumbent. (Arabic name.)

1. **C. edéntula** (Bigel.) Hook. var. **califórnica** Fer. Sea Rocket. Stems decumbent, often 2 ft. long; leaves oblanceolate or narrowly obovate, crenate or shallowly sinuate-toothed; pods 1 in. long or less, the lower segment cylindrical, the upper ovoid and acuminately narrowed to a flattened truncate often retuse beak.—Sea beaches from San Diego to Humboldt Bay; n. to B. C. Introduced. June-Sept.

7. RÁPHANUS L. Radish

Coarse much-branched annuals or biennials. Lower leaves lyrately pinnate or pinnatifid, shortly petioled. Flowers large, purple or yellow, or becoming white. Petals long-clawed. Pod thick, beaked by the stout style, 1-celled, filled with spongy or corky tissue, lightly constricted between the seeds or even moniliform, indehiscent or eventually breaking transversely into 1-seeded joints. Seeds subglobose; cotyledons conduplicate. (Greek raphanos, quick-appearing, the seeds promptly germinating.)

1. **R. satìvus** L. Wild Radish. Branching widely, 2 to 5 ft. high; herbage nearly glabrous or hispid with scattered hairs; lower leaves pinnately parted, crenate, the terminal segment large and round, the lateral segments smaller, ovate or oblong, sessile with the upper side adherent to the midrib, the lower lobe free; upper leaves mostly toothed, or with a few small lateral segments; flowers 8 to 9 lines broad, purple or white; pods 1 to 3 in. long, 3 to 4 lines broad, with one to several constrictions, 2 to 3-seeded, or the body of the pod globose and 1-seeded.—Common weed of waste places in towns and villages; nat. from Eur.

R. raphanístrum L. Jointed Charlock. Flowers yellow or white; pods moniliform, (1 or) 4 to 10-seeded.—Native of Eur., occasionally adventive: San Jacinto Valley; Pacific Grove; San Francisco; Berkeley; Elk Grove; Yosemite.

8. **BRÁSSICA** L. MUSTARD

Annuals, either glabrous or sparsely hispid with coarse hairs, the lower leaves usually lyrately pinnatifid or pinnate, the upper disposed to be more or less entire. Flowers large, yellow. Lateral sepals more or less gibbous at base. Petals with long claw and abruptly spreading limb. Papilla-like glands 4, green, alternating with the claws of the petals. Pods terete, terminating in a stout beak; valves 1 to several-nerved. Seeds in 1 row, globose; cotyledons conduplicate, incumbent.—All of our species are naturalized weeds. (The Latin name for cabbage.)

Pods ascending on spreading pedicels.
- Stem-leaves auriculate or cordate-clasping; beak terete ..... 1. *B. campestris.*
- Stem-leaves petioled or merely sessile; beak flattish ..... 2. *B. arvensis.*

Pods closely appressed to the stem.
- Stems glabrous or nearly so; pods somewhat quadrangular, the beak short. 3. *B. nigra.*
- Stems retrorse-hispidulose; pods terete, the beak ⅖ as long as the body, commonly containing a seed ..... 4. *B. adpressa.*

1. **B. campéstris** L. "COMMON YELLOW MUSTARD." Erect, sparingly branched, 1 to 6 ft. high; herbage succulent, glaucous, and glabrous save for some bristle-bearing pustules on the upper surface of the lower leaves; cauline leaves all sessile and clasping by an auricled base, the lower ones irregularly serrate or denticulate, and pinnatifid or pinnate with the terminal segment very large and the lateral segments sessile by a broad base and more or less decurrent on the rachis, the upper ones lanceolate and entire; flowers 6 to 8 lines broad; pods terete, 1¼ to 2½ in. long, narrowed into a subulate beak, tipped with a flat stigma.—European weed, abundant throughout Cal. Feb.-Apr.

2. **B. arvénsis** (L.) B.S.P. CHARLOCK. One to 2 ft. high, the herbage light green, hispid with scattered hairs; leaves pinnatifid, lobed or merely toothed, the upper rhombic, petioled or sessile by a narrow base, not clasping; petals 4 to 6 lines long; pods glabrous, ascending or erect, 1 to 1½ in. long, with 3 to 8 seeds in each cell; beak flattish, ⅓ as long as the body, often containing a seed; valves nerved.—Native of Eur., sparingly naturalized. Apr.

3. **B. nìgra** (L.) Koch. BLACK MUSTARD. Stems 3 to 6 or even 12 ft. high; herbage dark green (not glaucous), glabrous or with some scattered stiff hairs; leaves all petiolate, the lower lyrately pinnatifid or divided, terminal segment very large, shallowly lobed and sharply dentate; upper leaves less lobed or the uppermost linear and entire and commonly drooping or pendulous; racemes long and dense; petals 3½ lines long, much longer than the sepals; pods closely appressed to the axis of the raceme, torulose, indistinctly 4-sided, beaked by the style; seeds nearly black, highly pungent.—European weed, everywhere common; very abundant in interior grainfields. May-July.

4. **B. adprèssa** Boiss. Stems 1½ to 3 ft. high; herbage hispidulose, retrorsely so on the stems and petioles; leaves pinnately parted, or the uppermost merely lobed or subentire; flowering racemes subcapitate, much elongated in fruit; pods closely appressed to the axis, 5 to 7 lines long, the beak ⅖ to ½ as long as the body, constricted beyond the valves and bearing a single seed in the constricted portion.—Introd. from Eur. along the coast, Berkeley to Los Angeles, and spreading into the interior.

B. ÁLBA (L.) Boiss. White Mustard. Pods on spreading pedicels, bristly, the broad sword-shaped beak equaling or longer than the body; seeds few, large.—Native of Eur., adventive in grainfields: Surf; Byron. B. ERÙCA L. Garden Rocket. Somewhat succulent; flowers ½ to ¾ in. broad, variously colored, the petals strongly veined; pods erect-appressed, ¾ in. long, the stout flat beak ⅓ as long as the body.—Adventive from Eur.; Yreka; San Luis Obispo.

Diplotáxis DC. Herbs similar to Brassica. Leaves toothed or pinnatifid. Flowers yellow. Pod linear-elongated, flat or flattish, short-beaked, the valves mostly 1-nerved; seeds in 2 rows in each cell. 1. D. TENUIFÒLIA DC. Wall

Rocket. Perennial; stems leafy; flowers 5 to 6 lines long; pods 1 to 1½ in. long.—Native of Eur., adventive at Pasadena and Santa Ana. 2. D. MURÀLIS DC. Sand Rocket. Annual; leaves mostly basal; flowers 2 to 2 ½ lines long; pods 1 to 1⅛ in. long.—Native of Eur., adventive at San Bernardino.

9. **BARBÁREA** R. Br.

Perennial herbs similar to the yellow-flowered Radiculas. Stem angular. Leaves lyrate or pinnatifid. Flowers yellow. Stamens 6, distinctly tetradynamous. Pod linear, somewhat quadrangular, abruptly terminated by a pointed style, the valves strongly 1-nerved or carinate. Seeds in 1 row, turgid, not margined. (Named after St. Barbara.)

1. **B. vulgàris** (L.) R. Br. WINTER CRESS. Stems erect, rather stout, 10 to 16 in. high; herbage glabrous; basal leaves elliptic, sometimes cordate at base, ¾ to 2 in. long, with or without small supplementary lobes borne along the petiole; cauline similar, pinnatifid, with the terminal lobe largest and often oblong-lanceolate; raceme terminal and solitary or with several from the upper axils; petals narrowly obovate or oblanceolate, the blade scarcely narrowed into a claw, about 3 lines long, twice or nearly twice as long as the yellow sepals; pods 1½ in. long.—Along streams in the hills or mts., 300 to 9500 ft.: Coast Ranges; Sierra Nevada from Calaveras Co. to Tulare Co.; s. to S. Cal.; n. to Wash., e. to the Atlantic; Eur.

10. **RADÍCULA** Hill

Nearly or quite glabrous herbs, sometimes growing in water, mostly in wet places. Leaves toothed or pinnatifid or pinnately divided. Flowers small, white or yellow. Sepals spreading in anthesis. Petals scarcely clawed. Stigma capitate, nearly sessile. Pod linear or oblong, terete or nearly so, valves mostly 1-nerved. Seeds minute, in 2 rows; cotyledons accumbent. (Diminutive of Latin, radix, radish.)

Flowers white; petals distinctly clawed, nearly twice the length of the sepals; perennial.. 1. *R. nasturtium-aquaticum.*
Flowers yellow; petals scarcely clawed, little longer than the sepals.
  Pods linear, curved upward; annual.....2. *R. curvisiliqua.*
  Pods oblong, turgid, straight.
    Low diffuse plants; perennial.....3. *R. sinuata.*
    Plants erect, tall; biennial.....4. *R. palustris.*

1. **R. nastúrtium-aquáticum** (L.) Britt. & Rendle. WATER CRESS. Stems ascending or prostrate at base and rooting at the nodes; herbage glabrous; leaflets or segments 3 to 9, ovate or nearly round, the terminal always the largest, or the lowest leaves without lateral leaflets; flowers white, 2 to 2½ lines broad; petals nearly twice the length of the sepals; pods divaricately spreading, ½ to 1 in. long, the pedicels ⅔ to as long.—Abundant in slow-flowing creeks (especially where not bordered by trees) and about springs in the mts.; nat. from Eur.

2. **R. curvisíliqua** (Hook.) Greene. WESTERN YELLOW CRESS. Fig. 415. Stems several to many from the base, diffuse (rarely erect), 3 to 7 in. long (rarely to 1 or 1½ ft. long); leaves pinnatifid or pinnately parted (the segments varying from linear and commonly entire to oblong or ovate and either entire, toothed or pinnatifid), mostly ¾ to 2 in. long, or the lowest or basal often 3 to 12 in. long; pods linear, terete, more or less curved, 2½ to 7 lines long, the pedicels ½ to 1½ lines long.—Frequent in stream beds, margins of pools and marshy places throughout Cal., 10 to 7500 ft.; n. to B. C., e. to Wyo., s. to L. Cal. Exceedingly variable in foliage.

3. **R. sinuàta** (Nutt.) Greene. Stems decumbent or prostrate, branching, pale green, puberulent, 4 to 6 in. long; leaves more or less narrowly oblong or oblanceolate, usually deeply sinuately and regularly pinnately parted, the segments subequal, oblong to deltoid, entire or coarsely toothed; pods ovate to oblong, rounded at apex or pointed, 1½ to 2½ lines long, on pedicels 1½ to 2 lines long, style usually ½ to ¾ line long.—Montane, 5000 to 6000 ft.: San Bernardino Mts.; Sierra Nevada; n. to Saskat., e. to Ark. Var TRUNCÀTA Jepson n. var. Habit and leaves similar to the species; pods

oblong, 1½ to 1¾ lines long, truncate, the style very short. — San Gabriel Mts. (Crystal Lake, Peirson 2450, type). Var. ÍNTEGRA Jepson n. var. Leaves narrowly obovate to broadly oblong, not lobed, sparingly dentate or subentire; pods oblong-ovate, turgid, 1½ to 2 lines long, on pedicels ¾ line long.—Montane, 6000 to 10,200 ft., ranges e. of the Sierra Nevada from Inyo Co. (Silver Cañon, White Mts., Jepson 7354, type) to Modoc Co.

4. **R. palústris** Moench. MARSH CRESS. Biennial; stem erect, simple or mostly branched above, 2 to 5 ft. high, usually glabrous; leaves broadly oblanceolate or narrowly oblong in outline, coarsely toothed or, if deeply pinnatifid, mostly on the lower part of the blade, the lobes often irregularly dentate; pods oblong, turgid, 2 to 3 lines long, obtuse, the pedicels nearly as long; style ¼ to ½ line long.—Marshy places near streams, widely distributed in Cal., but not common; n. to B. C., e. to the Atlantic; Eur., Asia.

415. Radicula curvisiliqua Greene; *a*, habit x ½; *b*, fl. x 4; *c*, pod x 2.

11. **CARDÁMINE** L. BITTER CRESS

Ours erect herbs with leafy stems. Leaves pinnate, the basal in a rosette. Flowers white or pinkish. Very near Dentaria and scarcely separable, but the flowers smaller (in ours 1 to 3 lines long) and pods narrower. (Ancient Greek name of some species of cress.)

Leaves simple, undivided; petals 2 to 3 lines long; perennials.
- Stems many from an ascending, much-branched caudex; flowers white or pinkish; dwarf plants. . . . 1. *C. bellidifolia*
- Stem simple or branched above, from a running rootstock; flowers white; plants 1 to 2 ft. high. . . . 2. *C. lyallii*

Leaves, at least the cauline, with 3 to many pinnate leaflets; flowers white.
- Some basal leaves simple, the cauline 3 to 5-foliolate; petals 2½ to 3 lines long perennial. . . . 3. *C. breweri*
- Basal leaves pinnate.
  - Flowers rather large; petals 2½ to 3 lines long; perennial. . . . 4. *C. gambelii.*
  - Flowers smaller; petals 1 to 2 lines long; annuals or biennials.
    - Leaflets mostly roundish; capsules 8 to 20-seeded. . . . 5. *C. oligosperma.*
    - Leaflets mostly oblong or linear; capsules 20 to 30-seeded. . . . 6. *C. pennsylvanica.*

1. **C. bellidifòlia** L. Scape-like peduncles and leaves caespitose on the branched root-crown, the plants 2 to 6 in. high; herbage glabrous; leaves ovate or elliptic, 3 to 9 lines long, on slender petioles 2 to 3 times as long; flowers few; pods erect, 10 to 15 lines long.—High peaks of n. Cal., 7000 to 8000 ft.: Lassen Peak; Mt. Shasta; Medicine Lake; n. to Alas., e. to N. Eng.; Eur., Asia.

2. **C. lyállii** Wats. Stem erect from a rootstock, simple or branched, 10 to 15 in. high; herbage glabrous; leaves all simple, 6 to 8, reniform to cordate, subentire or shallowly sinuate, 1 to 2¾ in. broad; pods erect on spreading pedicels ¾ to 1¼ in. long; style very short.—Montane, 5500 to 6000 ft.: Placer Co. to Siskiyou Co.; n. to Ore., e. to northern Nev. June-July.

3. **C. bréweri** Wats. Stems from a slender rootstock, erect or decumbent at base, 7 to 16 in. high; herbage glabrous or nearly so; leaves 3 (or to 7)-foliolate, or the basal mostly simple; terminal leaflet usually round-cordate, entire to shallowly lobed; lateral leaflets usually smaller and rounded, the

upper more oblong or lanceolate; pods 8 to 13 lines long, ½ to ⅔ line wide, ascending or erect on pedicels 4 to 7 lines long; style almost none.—Montane, 4000 to 8500 ft.: Sierra Nevada from Tulare Co. to Modoc Co.; and near sea-level at Humboldt Bay; n. to Wash., e. to Wyo.

4. **C. gambélii** Wats. Stems rather stout, 2 to 4 ft. long, decumbent and rooting at base; herbage glabrous or sparingly soft-villous; leaflets 4 to 6 pairs, broadly ovate to narrowly oblong, cuneate at base, acute, 1 or 2-toothed on each side, 4 to 9 lines long; raceme very dense, becoming elongated; pods 9 to 10 lines long, on divaricate pedicels nearly as long; style slender, 1 line long.—Swamps, cismontane s. Cal., 1000 to 3000 ft., from Santa Barbara Co. to San Diego Co.; s. to Mex.

5. **C. oligospérma** Nutt. Stems branched from the base or simple, 3 to 14 in. high; herbage hispidulous or glabrous; leaves pinnate (the basal in a rosette), ½ to 1½ in. long (including the petiole); leaflets 5 to 11, little unequal, with a notch in each side toward the apex, 1 to 4 lines long, petiolulate; petals much surpassing the sepals; pods 6 to 9 (or 12) lines long, valves separating while still green-herbaceous; pedicels 1 to 2 lines long, little accrescent in fruit.—Under oaks and other trees in openly wooded country, 20 to 700 ft.: Coast Ranges from Monterey Co. to Humboldt Co.; n. to B. C.

6. **C. pennsylvánica** Muhl. Annual or biennial; stems simple or branched, 8 to 20 in. high; herbage glabrous or nearly so; leaflets 7 to 13, mostly oblong or linear, but those of the lowest leaves suborbicular, mostly sessile; pods suberect, on spreading pedicels 3 to 6 lines long.—Moist places, chiefly in the shade, 3000 to 4000 ft.: e. Nevada Co.; n. to Alaska, e. to the Atlantic.

12. **DENTÀRIA** L. Toothwort

Glabrous perennials. Stems and one or two long-petioled basal leaves from tuberous rootstocks, the stems rarely branched and sparingly leafy. Flowers in a raceme, large, white or rose-tinted. Sepals equal at base, erect or nearly so. Petals with slender claws and ovate spreading limb, much longer than the sepals. Pod linear, flattened, parallel to the partition, stout, attenuate above into the slender style, the valves and partitions not nerved; seeds wingless. (Latin, dens, a tooth, the rootstocks toothed in some species.)

Style 1 to 3 lines long.
Cauline leaves more or less scattered along stem, compound or simple; flowers in a raceme.....1. *D. integrifolia.*
Cauline leaves simple, approximate beneath the corymbose raceme...2. *D. corymbosa.*
Style 5 lines long.....3. *D. macrocarpa.*

1. **D. integrifòlia** Nutt. Milk-maids. Stems mostly one from the rootstock, erect, 6 to 21 in. high, the herbage rather fleshy; leaves thickish, the leaves or leaflets entire; basal leaves simple or trifoliolate, the leaves or leaflets orbicular, ovate or reniform, ½ to 2¾ in. long; cauline 3 or 5-foliolate, the leaflets orbicular to lanceolate or linear; raceme mostly single; corolla white, 6 lines broad; sepals green or dull red; pods flattened, 1 to 1½ in. long, terminating in a stout style 1½ to 2 lines long.—Valley floors or wet hillsides, always in open situations, 50 to 500 ft.: Coast Ranges from Monterey Co. to Marin Co., often whitening low moist fields in Mar.-Apr. Var. CALIFÓRNICA (Nutt.) Jepson. Leaves larger (1 to 2¾ in. long) and thinner, more commonly denticulate, sometimes pale purple beneath; flowers white or pale rose-color.—Shady banks or rich woods or thickets, 200 to 8700 ft., common in the hill country throughout cismontane Cal. (D. californica Nutt.) Var. TRÀCYI Jepson n. var. Leaves a very dense deep purple beneath, the basal smaller than in var. californica; flowers deep rose-pink, slightly smaller.—Woods, Van Duzen River, Humboldt Co. (Blue Slide, Tracy 5426, type). Var. CARDIOPHÝLLA Jepson n. comb. Leaves all undivided.—Vaca Mts.; Plumas Co. (Syn. Fl. 1:155). (Cardamine cardiophylla Greene.) Var. PACHYSTÍGMA Wats. Raceme sessile or nearly so.—Plumas Co.

2. **D. corymbòsa** Jepson n. sp. Plants 5 to 8 in. high; herbage glabrous; leaves all simple, mostly orbicular in outline, coarsely dentate or sometimes

lobed, especially at apex, 1 to 1¾ in. long; basal leaves round-cordate; cauline leaves mostly 2 or 3, approximate on upper part of stem; fruiting raceme corymbose, the lower pedicels 1 to 1¼ in. long; pods 1 to 1¾ in. long, not including the (2 to 3 lines long) style.—High peaks of the inner North Coast Ranges, 6500 to 7000 ft., from Yollo Bolly Mts. to n. Lake Co. Flowers unknown. (South Yollo Bolly, Jepson, type.)

3. **D. macrocárpa** Nutt. Similar to no. 1; style 5 lines long.—Plumas Co. to Del. Norte Co.; n. to Ore.

13. SMELÒWSKIA C. A. Mey.

Low caespitose perennials with stellate-pubescent herbage. Leaves deeply pinnatifid or bipinnatifid. Flowers in racemes, small, white, yellowish or purplish-tinged. Anthers slightly sagittate at base. Pods oblong-lanceolate or lanceolate, more or less obcompressed, the valves strongly keeled; style short. (Timotheus Smielowski, Russian botanist, 19th century.)

Herbage densely whitish-pubescent; leaf segments soft, obtuse; pods somewhat obcompressed but subteretish.....1. *S. calycina.*
Herbage greenish, thinly pubescent; leaf segments rigid, acute; pods obcompressed, distinctly though not strongly flattened.....2. *S. fremontii.*

1. **S. calycìna** (Desv.) C. A. Mey. Plants 1½ to 4½ in. high; herbage densely whitish-pubescent; leaves chiefly in a basal tuft, ½ to 1½ in. long, pinnately divided into linear or oblong segments 2 to 3 lines long; flowers white with rose-color veins, 1 to 2 lines long; pods linear, 3 to 5 lines long.—Montane, n. Sierra Nevada (Lassen Peak, sc. Shasta Co.); e. to Col., n. to Alas.; Siberia.

2. **S. fremóntii** Wats. Stems erect, tufted on the root-crown, 2 to 5½ in. high; herbage greenish, thinly pubescent; leaves 1 to 1½ in. long, divided into linear-subulate segments 3 lines long; flowers white or lemon-yellow; pods linear-oblong, 2½ to 5 lines long.—Hills and mountain valleys east of the Sierra Nevada crest from Plumas Co. to Modoc Co.; n. to Ore.

14. ÁRABIS L. Rock Cress

Ours erect and often tall annuals or biennials, or caespitose perennials. Flowers rose-purple, white or yellowish white. Sepals greenish or purplish, erect and equal, or the lateral pair slightly saccate at base. Petals obovate or spatulate, with narrow claw and flat blade, commonly much exceeding the sepals. Pods flattened parallel to the partition, the valves more or less 1-nerved. Seeds more or less winged; cotyledons accumbent. (Name from the land Arabia.)

A. Leaves all pinnately parted.

Plants decumbent, branching from base, hirsute; mainland.....1. *A. virginica.*
Plants erect, slender, branching above, glabrous; insular.....2. *A. filifolia.*

B. Leaves entire, or toothed, or only the basal pinnately parted.

1. Seeds nearly marginless; basal leaves broad, mostly spatulate to obovate.

Pods semi-terete, strictly erect; herbage glaucous, glabrous except at base....3. *A. glabra.*
Pods flattened, ascending or divaricate; herbage not glaucous.
Flowers greenish-white; herbage hirsute.....4. *A. hirsuta.*
Flowers crimson or rose-purple, showy; herbage commonly glabrous but the leaves ciliate with forked hairs.....5. *A. blepharophylla.*

2. Seeds wing-margined; pods flattened or flattish.

Cauline leaves petioled, entire, the basal ones repand.....6. *A. repanda.*
Cauline leaves sessile.
Pods narrowly linear.
Herbage glabrous or somewhat pubescent below; pods mostly ascending.
Cauline leaves many, auriculate-clasping; biennial, or perennial with slender branches to the caudex.....7. *A. drummondii.*
Cauline leaves merely sessile; perennial with very stout caudex.....8. *A cognata.*
Herbage pubescent; pods spreading or reflexed.
Pods glabrous; flowers 3 to 4 lines long; cauline leaves entire or merely toothed.
Caudex simple or with few branches, rarely woody.....9. *A. holboellii*

Caudex with branches several to many, woody.
Plants 2 to 7 in. high.
Pedicels glabrous; high Sierra Nevada.....10. *A. lemmonii.*
Pedicels pubescent; Coast Range peaks.....11. *A. breweri.*
Plants 7 to 18 in. high.
Basal leaves obovate to broadly oblanceolate, repand-dentate..
12. *A. gracilipes.*
Basal leaves linear to narrow-oblanceolate, entire.....
13. *A. perennans.*
Pods pubescent; flowers 4 to 6 lines long; cauline leaves pinnately incised.
14. *A. subpinnatifida.*
Pods broadly linear to oblong or elliptic, flattened; leaves entire.
Pods pendent or deflexed; plants 7 to 14 in. high.
Herbage canescent.
Pods linear, 1½ lines wide, pubescent; stigma sessile...15. *A. pulchra.*
Pods oblong, rounded at each end, ¼ in. wide, glabrous; stigma ⅓ line long.....16. *A. glaucovalvula.*
Herbage glabrous; style ⅓ line long.....17. *A. suffrutescens.*
Pods erect; plants 1 to 7 (or rarely 12) in. high.
Style ¼ to ⅓ line long or stigma sessile; herbage green.
Basal leaves not densely crowded, about 1 in. long..18. *A. platysperma.*
Basal leaves in a very dense tuft, 3 to 6 lines long.....19. *A. inamoena.*
Style 2 to 2½ lines long; herbage canescent.....20. *A. parishii*

1. **A. virgínica** (L.) Trel. Annual or biennial, nearly glabrous; stems several from the base, decumbent or ascending, 7 to 15 in. high; leaves deeply pinnatifid with nearly uniform oblong or linear few-toothed or entire segments; flowers small, white; pods linear, spreading, ¾ to 1 in. long, 1 line broad, on pedicels 1 to 2 lines long, beaked by a short pointed style; valves faintly veined or obscurely 1-nerved at base; seeds in 1 row.—Lower San Joaquin Valley to S. Cal.; s. to L. Cal.

2. **A. filifòlia** Greene. Delicate annual; stem erect, slender, branching above, 8 to 12 in. high; herbage glabrous, somewhat glaucous; leaves pinnately divided with filiform lobes, ¾ to 1 in. long; flowers roseate or purple; petals roundish-obovate, narrowed to a claw, 2½ to 3 lines long, about twice as long as the sepals; pods ascending or somewhat spreading, almost filiform-linear, acute, 1¼ to 1½ in. long; seeds in one row.—Santa Cruz Isl.

3. **A. glàbra** (L.) Bernh. Tower Mustard. Stems bluish green, erect, simple (very rarely branched), 2 to 4 ft. high from a biennial root; herbage glaucous and glabrous but often hispidulous at base; basal leaves broadly spatulate to narrow-obovate, coarsely dentate or merely denticulate, 1¼ to 4½ in. long, soon withering; cauline leaves ovate to lanceolate, entire, clasping by a sagittate base; petals dull white, 2 to 3 lines long, little exceeding the sepals; pods strictly erect or even appressed to the stem, straight, 3 to 4 in. long, ½ to ¾ line wide, on pedicels 3 to 5 lines long; seeds in 2 rows, narrowly winged or wingless.—Foothills and mts., 100 to 4700 ft.: Coast Ranges, Sierra Nevada, and cismontane S. Cal., widely distributed and not rare, but the plants commonly solitary; n. to Can., and e. to N. Eng.; Eur., Asia, Aust. Apr.

4. **A. hirsùta** Scop. Hairy Rock Cress. Biennial; stems erect, simple or strictly branched, 1 to 3 ft. high; herbage deep green, rather sparsely hirsute; leaves entire or sparingly dentate, the basal oblanceolate to elliptic oblong on short petioles, winged, 1 to 3 in. long, the cauline oblong to lanceolate, sessile by a subcordate base; petals white, 2 to 4 lines long; pods linear-filiform, 1½ to 2 in. long, ⅓ to ½ line wide, erect, on slender pedicels 2 to 5 lines long; valves faintly nerved below the middle and more or less veined; style scarcely any; seeds in one row, suborbicular, very narrowly margined.—Widely scattered in Cal., but rare; e. to Ga., n. to Alas.; Eur., Asia.

5. **A. blepharophýlla** H. & A. Rose Cress. Stems few or several from the crown of a perennial root, 4 to 12 in. high; herbage deep green, most commonly glabrous; leaves dentate or entire, ciliate with forked hairs, the basal broadly spatulate to obovate, obtuse, the few cauline oblong, sessile: flowers large and fragrant; sepals often colored, broad, 2 to 3 lines long, one pair more or less saccate at base and broader than the other pair; petals rose-purple, 5 to 7 lines long; pods erect or ascending, nearly straight, 1 to 1½ in. long, 1 line wide; valves veined, 1-nerved; seeds in 1 row.—Rocky

hillsides and ridges near the sea: Marin Co. to Monterey Co. Mar.-Apr. Var. MACDÓNALDIÀNA Jepson n. comb. Stems 3 to 5 in. high; herbage glabrous; petals oblanceolate, truncate, 4 lines long; stamens with broad filaments the upper and lower pairs exceeding the sepals, the lateral pair much shorter —Nw. Mendocino Co. (A. macdonaldiana Eastw.)

6. **A. repánda** Wats. Stem from a biennial root, 1¼ to 1¾ (or 2⅛ ft. high, branching above the base; herbage stellate-pubescent, or the hairs at base simple and longer; leaves (the basal ones somewhat rosulate) obovate to oblanceolate, repandly few-toothed or nearly entire, 2 to 4¼ in. long; flowers dull white, small; sepal pairs unequal in breadth; petals narrow, approximate, 2 to 3 lines long, a little exceeding the sepals; pods recurved-spreading, 1-nerved at base, 2½ to 3¼ in. long; pedicels 1 to 2 lines long; seeds in one row, elliptical, broadly winged.—Montane, 6000 to 8500 ft.: Sierra Nevada from Mariposa Co. to Tulare Co., thence w. to the San Emigdio Range and s. to the San Gabriel and San Jacinto mountains.

7. **A. drummóndii** Gray. Stems erect, stout, leafy, mostly simple, 1 to 2 ft. high, one to several from a biennial root, or sometimes a shortly branched caudex; basal leaves oblanceolate, entire, mostly glabrous, with ciliate margins, ½ to 1¼ in. long; cauline leaves glabrous; petals white to rose-color, 3 to 4 lines long; pods erect, crowded, 1½ to 2½ in. long, 1 line wide: seeds narrowly winged, 1 line long.—Sierra Nevada from Fresno Co. to Siskiyou Co.; e. to Rocky Mts., n. to Can. Passes by intergrades into var LYÁLLII Jepson n. comb. Perennial; stems slender, ½ to 3 (or sometimes 12) in. high, many from the slender branches of a loosely branched caudex; basal leaves 3 to 6 (or 10) lines long; petals 1½ to 3 lines long; pods shorter and narrower.—Montane, 9600 to 11,600 ft.: frequent in the Sierra Nevada from Tulare Co. to Modoc Co.; n. to B. C., e. to Mont. and Utah. (A. lyallii Wats.)

8. **A. cognàta** Jepson n. sp. Stems slender, one to many, 2 to 4 in. high, arising from the crown of a very stout and densely scaly caudex; herbage glabrous; basal leaves crowded, oblanceolate, ¾ to 1 in. long, 2 to 3 lines wide, tapering gradually to a slender petiole as long or longer than the blade; cauline leaves obovate, sessile; flowers rose-purple, 3½ lines long; fruiting pedicels slender, 3 to 7 lines long; pods divaricately spreading, ¾ to 1¾ in. long, 1 line wide; seeds winged at apex, ½ line long.—Montane, 5700 to 7800 ft.: Sierra Nevada from Mariposa Co. to Plumas Co. (Mt. Elwell, C. M. Wilder, type).

9. **A. holbóellii** Hornem. Plants 9 to 12 in. high; herbage green, finely stellate-pubescent; flowers white; raceme one-sided, the pods pendulous or reflexed; seeds in one row, sometimes imperfectly in 2 rows, narrowly wing-margined.—Boreal North America. Var. RETROFRÁCTA Jepson n. comb. Biennial; stem usually solitary, erect, simple or branched, 7 to 12 in. high, pubescent with simple or forked hairs; leaves pubescent with hairs more or less forked to stellate; basal leaves oblanceolate, repand-dentate, ¾ to 1½ in. long, the cauline linear-oblong, acute, entire, ½ to 1 in. long; flowers purple or white, 2 to 3 lines long; pods linear, straight or arcuate, 1½ to 2 in. long, more or less reflexed or spreading on hairy or rarely pubescent pedicels, seldom strictly secund.—Montane, 3500 to 6000 ft.: nw. Mendocino Co. to Siskiyou and Modoc Cos.; n. to Wash., e. to Ida. (A. retrofracta Graham.) Var. FÉNDLERI Wats. Fig. 416. Biennial; stems 1 or several from the base, simple or branched, 2 to 3 ft. high, pubescent below with rather coarse simple

416. Arabis holboellii var. fendleri Wats.; habit x ⅓.

417. Arabis holboellii Hornem. var. arcuata Jepson; habit x ⅓.

or forked hairs; basal leaves oblanceolate, dentate, ¾ to 1½ in. long; cauline leaves oblong-lanceolate, ¾ to 1¼ in. long; flowers pink, 3 lines long; pods straight, or slightly curved, 2½ to 3¾ in. long, typically rather closely reflexed, usually secund on glabrous pedicels.—Montane, 4000 to 9000 ft.: Sierra Nevada from Siskiyou Co. to Tulare Co.; White Mts.; San Gabriel Mts.; San Bernardino Mts.; thence e. to N. Mex. Var. SECÚNDA Jepson n. comb. Biennial or perennial; stems simple, several from the base or solitary, branched above, 8 to 18 in. high; herbage densely pubescent below, scantily pubescent above; leaves 1 to 1½ in. long, the basal petioled, oblanceolate, repand-toothed, the cauline sagittate-clasping, oblong-linear, repand or entire; flowers white, 3½ lines long, becoming pendent on pubescent pedicels; pods narrow, secund, deflexed, 1½ to 2½ in. long.—N. Humboldt Co. and w. Siskiyou Co.; n. to Wash. (A. secunda Howell.) Var. ARCUÀTA Jepson n. comb. Fig. 417. Stems usually simple and erect, 1 to 2½ ft. high from a perennial caudex; herbage stellate-pubescent throughout; basal leaves linear-oblanceolate, mostly acute, entire or repand-dentate, 1 to 1½ or 2¼ in. long, the petioles often ciliate; cauline leaves linear to lanceolate, mostly entire; flowers 3 to 3½ lines long, mostly dark red; pods curved or nearly straight, 2 to 3¾ in. long, ¾ to 1½ lines wide, acute, spreading or deflexed on divaricate pubescent or pilose pedicels 2 to 5 lines long.—Mountains, 2500 to 6000 ft.: South Coast Ranges; Sierra Nevada from Yosemite to Tulare Co.; cismontane S. Cal.; s. to L. Cal. (A. arcuata Gray.)

10. **A. lemmònii** Wats. Stems few to many from a branched perennial crown, 3 to 9 in. high; herbage pubescent, occasionally glabrous above; lower leaves spatulate to oblanceolate, petioled, 3 to 6 or 8 lines long, covered with a fine but dense whitish felt, the hairs short with the several branches rebranched; flowers light purple, 2 to 3 lines long; pods glabrous, straight or nearly so, 1 to 1½ in. long, widely

418. Arabis breweri Wats., habit x ⅓.

spreading or recurved; pedicels glabrous, seeds narrowly winged, in one row.—Rocky places, 8500 to 11,000 ft.: White Mts.; Sierra Nevada from Tulare and Inyo Cos. to Shasta Co.; n. to B. C., e. to Mont. and Wyo. It is very near A. breweri in habit and character, but the stems are more slender and the leaves grayer.

11. **A. bréweri** Wats. BREWER ROCK CRESS. Fig. 418. Stems many from the much branched crown of a stout woody root, 2 to 6 in. high; herbage pubescent, the hairs seldom more than 3-forked; lower leaves broadly spatulate, entire, or rarely with 1 or 2 teeth, 3 to 10 lines long, the petioles ciliate; upper leaves lanceolate to oblong, sessile by a subcordate base or obtusely auriculate; flowers bright red-purple or nearly white, 3 to 4 lines long, the pedicels and purplish calyx more or less pubescent; pods spreading and arcuate, glabrous, 1½ to 2½ in. long, 1 line broad; seeds orbicular, narrowly winged, in one row or nearly so.—Rocky summits of mountain peaks in the Coast Ranges from Siskiyou Co. to Santa Clara Co.

12. **A. gracílipes** Greene. Stems 2 to several, 7 to 14 (or 16) in. high, from the loosely branched crown of a perennial root, hairy-pubescent below, glabrous above; basal leaves loose, obovate, long-petioled, repand-dentate, thinly pubescent with 3 to 4-branched hairs, 1 to 1½ in. long; later leaves oblanceolate or the upper cauline oblong to lanceolate, sessile; sepals very thinly pubescent with 3 to 4-branched hairs or almost glabrous; petals narrow with purple blade; pods glabrous, 1¼ to 2½ in. long, spreading on very slender glabrous pedicels ¼ to 1 in. long; seeds in one row.—Mts. of the Colorado and Mohave deserts, n. to Inyo Co., e. to Ariz. (A. arcuata var. longipes Wats.)

13. **A. perénnans** Wats. Stems several, erect from a usually branching and somewhat woody root-crown, 1 to 1½ ft. high; herbage stellate-canescent, or stellate-puberulent and greenish, or glabrous above; basal leaves narrow-oblanceolate, 1 to 2 in. long, the petioles sometimes ciliate; cauline leaves linear to lanceolate; raceme rather loose; flowers reddish or pale, 2 to 3 lines long; calyx and pedicels stellate-pubescent to glabrous; pods glabrous, rarely thinly puberulent, straight or nearly so, 1 to 4 in. long, 1 line wide, widely spreading or recurved on pedicels 2 to 6 lines long; stigma small, sessile; seeds in 2 rows, orbicular, very narrowly margined.—Mountain ranges in and bordering the Colorado and Mohave deserts, n. to Inyo Co.; e. to Utah and Ariz.

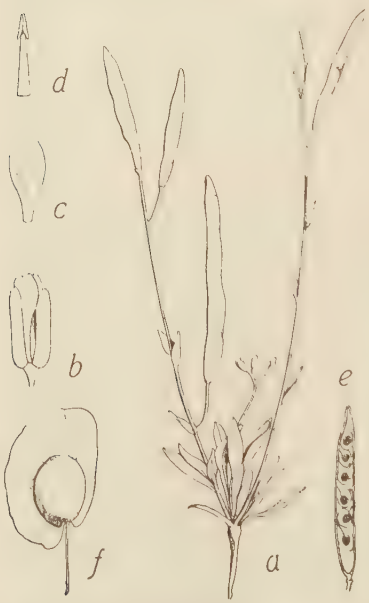
14. **A. subpínnatífida** Wats. Stems simple, 1 or few from a biennial or perennial root, 8 to 12 in. high; herbage (especially the leaves) canescent or almost silvery; basal leaves tufted, very narrowly linear-oblanceolate, entire or toothed, petioled, 1 to 2 in. long, the cauline lanceolate, unequally or saliently incised, sometimes merely toothed, or the uppermost entire; flowers rose-color or white, 5 to 7 lines long; pods pubescent, slightly curved, 2 to 3 (or 5) in. long, 1 to 1½ lines wide, attenuate to a short style, and pendent upon recurved or spreading puberulent or hairy pedicels 2 to 5 lines long; seeds in 1 row, as broad as the partition, winged.—Mts. of Siskiyou Co.; sw. Ore. to n. Nev. Var. BECKWÍTHII Jepson n. comb. Stouter; leaves less strongly toothed or entire.—E. slope Sierra Nevada, Siskiyou and Modoc Cos. s. to Inyo Co. It approaches A. pulchra. (A. beckwithii Wats.)

15. **A. púlchra** Jones. Stems erect, leafy, 12 to 15 in. high, few or several from a branching woody crown; herbage stellate-canescent throughout or glabrate; lower leaves narrowly oblanceolate and petioled, 1 to 2 in. long, the upper linear-lanceolate, sessile; raceme rather dense; flowers usually large, soon spreading or reflexed; petals 4 to 6 lines long, rose-color, about twice as long as the pubescent sepals; pods pendent, finely pubescent, 1½ to 2¼ in. long, 1½ lines wide, on pedicels 1 to 6 lines long; stigma sessile; valves 1-nerved, veined; seeds small, in 2 rows, orbicular, winged.—Mts. and higher slopes on the borders of the Mohave and Colorado deserts; e. to Col.

16. **A. glaucoválvula** Jones. Fig. 419. Stems several from a branching woody crown, branched above, 7 to 14 in. high; herbage canescent; leaves mostly basal, oblanceolate, petioled, 1 to 2 in. long, the cauline few, linear to lanceolate, reduced and sessile; flowers rather large, purple, in one-sided racemes; sepals ovate, woolly-pubescent with scarious margins; pods deflexed, glabrous, glaucous, narrow-oblong, rounded at each end, 1-nerved and veiny, 1¼ to 1⅝ in. long, ¼ in. wide, on pedicels 2 to 4 lines long; style stout and rather prominent; seeds in 2 rows with broad membranous wings, 2 lines broad.—Gravelly mesas, 2200 to 5000 ft.: Inyo Co.; e. Mohave Desert.

419. Arabis glaucovalvula Jones; *a*, habit x ⅓; *b*, seed x 1½.

17. **A. suffrutéscens** Wats. Stems several, 7 to 14 in. high, from a branching woody caudex; herbage glabrous, or the basal leaves sparsely ciliate; basal leaves oblanceolate, cauline lanceolate, the lower scarcely auriculate; flowers few, 3 lines long, purplish; pods 1½ to 2 in. long, 1½ to 3 lines broad, pendulous on pedicels 4 to 9 lines long; valves 1-nerved, veined; seeds in 2 rows.—Dry or stony situations, e. and n. of the Sierra Nevada crest from Placer Co. to Siskiyou Co.; rarely collected in Cal.; n. to Wash.



420. Arabis platysperma Gray; *a*, habit x ½; *b*, fl. x 3; *c*, petal x 3; *d*, stamen from behind x 3; *e*, dehiscent pod x ½; *f*, seed x 3.

18. **A. platyspérma** Gray. Fig. 420. Stems erect or ascending from a slender branching rootstock, 2¼ to 12 in. high; herbage glaucous, finely pubescent or hispidulous or glabrous; basal leaves oblanceolate, narrowed to a short petiole, ¾ to 1¼ in. long, the upper oblong- to linear-lanceolate, sessile; petals at first white, changing to rose-color, 2 to 3 lines long, the sepals ½ to nearly as long, glabrous or hispid towards apex; pods erect or a little spreading, 1 to 2 in. long, 1½ to 2 lines broad, tipped with a short stout style; valves distinctly veined, 1-nerved toward the base; seeds in 1 row, orbicular, winged all around (or nearly so) with a broad scarious membrane.—High montane slopes, 7000 to 13,000 ft.: inner North Coast Ranges; Sierra Nevada; San Gabriel Mts.; San Jacinto Mts. June. Var. HOWÉLLII Jepson n. comb. Seeds in 2 rows.—Siskiyou Mts. (s. Ore.); White Mts. (Arabis howellii Wats.)

19. **A. inamoèna** Greene. Stems scapelike, arising from the dense basal leaf rosettes of the branched caudex, 1 to 1½ in. high; leaves narrowly oblanceolate, 2 to 5 lines long, about ½ line

wide, hispid, persistent for 1 to 3 years in dense whorls below the leaves of the season; pods similar to no. 18.—Whitney plateau, s. Sierra Nevada, 8500 to 10,000 ft.

20. **A. parishii** Wats. Stems slender, simple, erect, 1 to 5 in. high, several to many from the densely tufted crown of a simple or branched caudex; herbage finely stellate-pubescent; basal leaves numerous, linear-oblanceolate, entire, 2 to 5 (or 7) lines long, the cauline few and linear, or none; petals rose-color, 3 to 4 lines long, twice as long as the purplish sepals; pods glabrous, 7 to 9 lines long, 1 to 1¼ lines wide, ascending on pedicels 2 to 3 lines long; style filiform, 2 to 2½ lines long; valves 1-nerved and veined; seeds in 1 row, elliptical, narrowly winged.—San Bernardino Mts., 6500 to 9800 ft.

15. ERÝSIMUM L. Wall Flower

Erect stoutish biennials or perennials, simple or with few branches. Leaves narrow, entire or dentate. Flowers large, orange to light yellow. Sepals narrow, equal at base or the lateral saccate. Petals with slender claws and obovate blades. Pods linear, flattened, with 1-nerved valves, or quadrangular. Seeds in 1 row, numerous, not margined. (Greek name of a garden plant.)

Stems simple above the base.
Flowers cream-color or yellowish; pods flattened parallel to the partition; littoral..... 1. *E. capitatum.*
Flowers orange; pods 4-sided; montane.....2. *E. asperum.*
Stems profusely branched from the base; flowers yellow; pods 4-sided; insular..... 3. *E. insulare.*

1. **E. capitàtum** (Dougl.) Greene. Biennial; stems stout, erect, ½ to 1½ ft. high, leafy; herbage puberulent; leaves narrowly oblong, gradually contracted to a petiole, entire or repand-dentate, 1 to 3 in. long; flowers cream-color to yellowish, rarely white, at first sub-capitate, the axis elongating in fruit and becoming a raceme; pods spreading or divaricate, 1½ to 3½ in. long, 1½ lines wide, abruptly short-pointed; valves flattish, 1-nerved; seeds broadly oblong to orbicular sometimes with narrow margin.—Along the coast from Los Angeles to Del Norte Co.; n. to Wash.

2. **E. àsperum** (Nutt.) DC. Western Wall Flower. Biennial or perennial; stems erect, simple or branching above, 1 to 2½ ft. high, densely leafy below; herbage strigulose, the hairs often stellately 3-parted; leaves narrow (2 to 6 lines wide and 3 to 6 in. long, or the uppermost shorter), entire or sharply dentate, the lower slender-petioled; flowers orange, 8 to 10 lines in diameter; pods 4-sided, ascending or widely spreading, commonly 3 to 4 in. long, 1 line wide; seeds oblong, turgid, often slightly winged at one end.—Common on rocky hills and mountains throughout Cal. Mar.-Apr. Var. perènne Wats. Perennial; stems more slender, often tufted, 5 to 15 in. high; flowers lemon-yellow; pods thinner, flattened, tapering at apex.—Subalpine, 8000 to 12,000 ft., Sierra Nevada from Mariposa Co. to Tulare Co.

3. **E. insulàre** Greene. Stem stout, profusely branched, woody at base; leaves long linear, crowded, attenuate and often recurved at the tip, 1½ to 2½ in. long; raceme short; seeds not margined.—Sandy slopes, San Miguel and Santa Rosa islands.

E. repándum L. Annual, branched above; leaves linear-lanceolate, repand-dentate; flowers yellow, 2 to 3 lines long; pods 4-sided, 2½ in. long, rigid, horizontal, spine-like.—Introd. from Eur.; troublesome in alfalfa fields in Modoc Co., becoming a tumbleweed; sometimes miscalled Russian Thistle.

E. cheriánthoïdes L. Erect, branching above; leaves lanceolate, entire or slightly dentate, short-petioled; flowers pale yellow, 2 lines long; pods 4-sided, ¾ to 1 in. long, ascending on slender spreading pedicels 4 lines long.—Adventive along railroad, Placer Co.; introd. from Eur.

16. MATTHÌOLA R. Br.

Stout stellate-tomentose herbs with oblong or linear leaves. Flowers usually purple, sweet-scented; petals with long claws and broad showy blades.

Pod large, linear, nearly terete or compressed; stigmas thickened or horned at the back. (Peter Andrew Matthioli, 1500-1577, Italian physician and celebrated botanist.)

1. **M. incàna** (L.) R. Br. GARDEN STOCK. Stems erect, branched above, 2 ft. high; leaves entire or sinuately dentate, 4 to 7 in. long; flowers ¾ to 1¼ in. broad; pods 2½ to 4 in. long; seeds thin, flat, circular, wing-margined. —Native of Eur.; naturalized along the seashore bluffs of San Diego and Orange Cos.

17. **PÁRRYA** R. Br.

Perennial herbs, with basal leaves and flowering stems borne on the crown of a simple or branched caudex. Flowers purple or rose-colored, the clusters showy. Stigma 2-lobed. Pod very strongly flattened, produced at apex into a prominent acute or attenuate point, the valves 1-nerved. Seeds in 2 rows, convex or turgid. (Capt. W. E. Parry, British navigator, who discovered the first-known species while on quest of the Northwest Passage.)

Pods divaricately spreading; flowering stems 2 to 3 times as long as the leaves. . . . . 1. *P. menziesii.*
Pods ascending; flowering stems scarcely exceeding the leaves. . . . . 2. *P. eurycarpa.*

1. **P. menzièsii** (Hook.) Greene. Plants 3 to 6 in. high, the flowering scapose stems and the leaves caespitose on a thick caudex, the caudex simple or with few short branches; leaves spatulate or oblanceolate, acute or obtuse, densely stellate-tomentose, entire, drawn down to a petiole at base, 1 to 4 in. long; racemes many-flowered; pods ensiform, attenuate to the short style, 1 to 1½ in. long, glabrous, 2 to 4-seeded; pedicels 3 to 4 lines long, both the pedicels and the pods spreading horizontally.—Montane, 4000 to 9600 ft.: e. slope of the Sierra Nevada from Inyo Co. to Modoc Co., w. to Siskiyou Co., thence s. to Mendocino Co.; w. Nev. to Ore. Var. GLÀBRA Jepson n. var. Plant entirely glabrous.—Lake City Mt., Modoc Co. (C. C. Bruce 2250, type).

2. **P. eurycárpa** (Gray) Jepson n. comb. Plants 1 to 2 in. high, the flowering stems and leaves caespitose on a slender branched caudex; herbage stellate-pubescent; leaves oblanceolate, 4 to 6 lines long; raceme few-flowered; pods oblong-ovate, acute, glabrous, ¾ to 1 in. long, 3 to 5 lines broad; style ½ line long; seeds oval, the seed-coat covered with silvery-white more or less crisped scales or processes.—Subalpine slides, 11,500 to 14,300 ft.: Sierra Nevada from Tulare Co. to Tuolumne Co.; White Mts.; n. to Ida. (Draba eurycarpa Gray.)

18. **TRÓPIDOCÁRPUM** Hook.

Erect or diffusely spreading annuals with pubescent herbage, pinnatifid leaves and leafy racemes of rather small yellow flowers. Sepals concave, ovate-oblong, spreading. Petals cuneate-obovate. Stamens tetradynamous; anthers roundish. Style slender, sometimes short. Pod completely or partially 2-celled, or 1-celled, strongly flattened contrary to the narrow partition, or only the upper part flattened, or somewhat inflated; valves 2 to 4, opening from above; seeds in 2 to 4 rows. (Greek tropis, keel, and karpos, fruit, in reference to the carinate valves of the capsule.)

Plants, when robust, with mostly straggling branches; pods 2-valved and 2-celled. . . . . 1. *T. gracile.*
Plants commonly erect; pods 4-valved and 1-celled. . . . . 2. *T. capparideum.*

1. **T. grácile** Hook. Stems erect or at last very diffuse, 5 to 14 in. long; leaves pinnatifid, the segments commonly linear, acutish, cleft or entire; leaves of the inflorescence similar but reduced; pedicels axillary, 3 to 10 lines long, spreading; stamens very unequal; pods linear, strongly obcompressed throughout, tardily dehiscent, 1 to 1½ in. long; seeds in 2 rows.—Plains and low hills bordering the Great Valley; South Coast Ranges; Inyo Co. and s. through the Mohave Desert to San Diego Co. Var. DÙBIUM Jepson n. comb. Pods 1-celled below, the partition persistent in the upper third or fourth; otherwise like the species.—West side of the San Joaquin Valley and s. to coastal S. Cal. (T. dubium Dav.)

2. **T. capparídeum** Greene. Stem stoutish, erect, 8 to 10 in. high, simple or sparingly branched; foliage as in T. gracile, the upper leaves somewhat more deeply parted and with longer subentire segments; pods linear-oblong, 7 to 10 lines long, 2 lines wide, somewhat inflated, 1-celled, conspicuously 6-nerved, tipped with a short style; valves 4, the dehiscence beginning at the apex; seeds in 4 rows.—Alkaline soil, Mt. Diablo range and bordering plains.

19. **LYROCÁRPA** Hook. & Harv.

Erect herbs, ours perennial, with somewhat flexuous branches and stellate-pubescence. Leaves toothed or runcinately pinnatifid. Sepals linear-oblong, sharply acute, strongly connivent. Petals in ours linear-elongated. Style short or none. Stigma rather large. Pod in ours fiddle-shape, flattened contrary to the narrow partition. (Greek lyra, a lyre, and karpos, fruit.)

421. Lyrocarpa coulteri Hook. & Harv.; *a*, basal leaf x ½; *b*, cauline leaf x ½; *c*, fl. x 1; *d*, fr. branchlet x½.

1. **L. còulteri** Hook. & Harv. Fig. 421. Stems several, woody at base, 1½ to 2 ft. high; flowers in a loose raceme, maturing slowly, sweet-scented; sepals stellate-tomentose, strongly connivent ⅘ their length, becoming distinct from below; petals tawny yellow, lance-linear, 6 to 8 lines long, tapering to a long, slender claw; seeds 2 to several in each cell, round, flat.—Western Colorado Desert; s. to L. Cal. and Sonora.

20. **LESQUERÉLLA** Wats.

Low herbs, ours stellate-pubescent throughout. Flowers usually yellow. Style slender; stigma entire or nearly so. Pod globose-inflated to obovate; cells 2 to 15-seeded; seeds flattened; cotyledons accumbent. (Leo Lesquereux, distinguished American paleobotanist and bryologist, 1805-1889.)

Annual; basal leaves not forming a rosette; pods globose, as if glabrous but minutely pubescent under a lens; style a little shorter than the pod.....1. *L. palmeri.*
Perennial; basal leaves in a rosette; style equaling or slightly longer than the pods; pedicels straight or straightish.
Pods globose or subglobose, thinly pubescent; flowers yellow, 3 lines long..2. *L. kingii.*
Pods flattened on the margins, ovate, densely pubescent; flowers deep yellow, 4 lines long.....3. *L. occidentalis.*

1. **L. pálmeri** Wats. Stems slender, mostly erect; leaves oblong-oblanceolate, narrowed to a slender petiole; pedicels ascending, horizontal or recurved, usually sigmoid; ovules 4 to 6 in each cell; pods 1½ lines in diameter.—E. Colorado and Mohave deserts; e. to Ariz., s. to L. Cal.

2. **L. kingii** Wats. Stems ascending or decumbent, 2 to 7 in. long; basal leaves suborbicular to elliptic, entire or 1 to 3-dentate on each side, drawn down to petiole 1 to 1½ times as long; cauline leaves oblanceolate; pods 2 to 3 lines in diameter, the cells 2 to 4-ovuled.—East side of the Sierra Nevada (or its northern crests) from Inyo Co. to Modoc Co., 5000 to 11,500 ft.

3. **L. occidentàlis** Wats. Stems erect or ascending, 3 to 9 in. high, from the crown of a stout taproot; leaves entire, the basal orbicular to elliptic, varying to oblanceolate, narrowed to petioles 1½ to 2 times as long, the cauline spatulate; flowers 3 to 4 lines long; pods somewhat flattened, ovate, acutish, 2 to 4 lines long; cells 4-ovuled.—East side and north end of the

Sierra Nevada from Placer Co. to Siskiyou Co., thence s. to Lake Co.; n. to Ore.

21. **DITHÝREA** Harv.

Ours an annual herb with finely pubescent herbage. Sepals stellate-tomentose, connivent above, forming a closed tube. Petals white or tinged with purple, conspicuous, broadly spatulate, with spreading blades and slender claws. Stamens 6; anthers linear, sagittate. Pod strongly obcompressed and didymous, that is notched both above and below, the lobes suborbicular, with a distinct cord-like margin. Style almost none, crowned by a large helmet-shaped stigma. (Greek, dis, two, and thureos, shield, referring to the flattened twin fruit.)

422. Dithyrea californica Harv.; *a*, habit x ½; *b*, fr. branchlet x ½; *c*, pod x 2.

1. **D. californica** Harv. SPECTACLE POD. Fig. 422. Stems several from the base, spreading or ascending, 4 to 10 in. or 1½ ft. high, very brittle at the joints; leaves thickish, ovate or oblong-ovate shallowly and somewhat sinuately few-toothed, 1 to 3¼ in. long, the basal on petioles nearly as long, the cauline nearly sessile and somewhat cuneate at base; racemes very dense; flowers sweet-scented, 4 to 5 lines long, on pedicels scarcely 1 line long; pods with a tomentose-margined border, 3 to 4 lines broad. —Sandy soil in the deserts: Inyo Co., Mohave and Colorado deserts; s. to Mex., e. to Nev. Var. MARÍTIMA Dav. Leaves mostly orbicular, sinuate to entire, thicker, distinctly fleshy, more densely canescent-tomentose; racemes very dense; pods more densely pubescent. — Coast sand dunes from Los Angeles Co. to San Luis Obispo Co.

22. **THLÁSPI** L.

Herbs with undivided leaves, the cauline ones auriculate-clasping. Flowers in ours white. Sepals short, oval, obtuse. Petals obovate or oblanceolate. Anthers short, oval. Pods obcompressed, in ours obcuneate, obovate or orbicular, the valves often winged, especially towards the apex. Seeds 2 or several in each cell; cotyledons accumbent. (Greek thlan, to crush, on account of the strongly flattened pods.)

Perennial; pod obovate; seed smooth ..... 1. *T. alpestre.*
Annual; pod orbicular; seed rugose ..... 2. *T. arvense.*

1. **T. alpéstre** L. Fig. 423a. Stems commonly many from a branching perennial crown, 3 to 8 in. high; leaves mostly in a basal tuft, round-obovate to oblanceolate, 3 to 6 lines long, narrowed to slender petioles 1 to 2 times as long, the cauline ovate to oblong, sessile-auriculate; raceme rather dense; flowers white, 2 to 3 lines long; petals rather spreading, twice the length of the sepals; pods narrowly obovate or obcuneate, 3 to 4 lines long, twice as long as wide, retuse or truncate at apex, flattened toward the margin, the summit narrowly winged; style slender, ½ to nearly 1 line long.—Northern mts., 3800 to 4000 ft.: Humboldt, Trinity, and Siskiyou Cos., e. to Plumas Co. Var. CALIFÓRNICUM Jepson n. comb. Fig. 423b, c, d. Four to 12 in. high; raceme looser; pods truncate to retuse at apex.—N. Humboldt Co. (T. californicum Wats.)

2. **T. arvénse** L. Penny Cress. Annual, erect, 8 to 14 in. high; often branched above; leaves ½ to 2 in. long, rather remotely toothed; the basal spatulate, the cauline oblong, obtuse; flowers smaller than in T. alpestre and with narrower petals; pods orbicular, or nearly so, ½ in. in diameter, strongly obcompressed, broadly winged, the apex deeply notched; style very short.—Introd. from Eur., adventive in Modoc and Los Angeles Cos. Also called French Weed.

Ionopsídium acáule (Desf.) Rchb. Annual, 2 to 2½ in. high; stem short, rather densely leafy, each axil bearing a long naked one-flowered peduncle; leaves ovate, entire, 2 lines long, long-petioled; pods obcompressed, flattened, round-ovate, 2 lines long.—Adventive at Ferndale, Humboldt Co.; native of Portugal.

423. Thlaspi alpestre L.; *a*, pod x 2; var. californicum Jepson; *b*, habit x ½; *c*, fr. raceme x ½; *d*, pod x 2.

23. **CORÒNOPUS** Ludwig.

Prostrate heavy-scented annuals, with pinnatifid leaves and short racemes of minute greenish white flowers. Sepals oval, spreading. Stamens 6 or often only 4 or 2. Pod small, more or less didymous, flattened contrary to the narrow partition, the surface strongly wrinkled or tuberculate; valves falling away at maturity from the persistent axis as closed or nearly closed nutlets. Cotyledons incumbent. (Greek korono, crow, and pous, foot, because of the shape of the leaves.)

1. **C. dídymus** (L.) Sm. Wart Cress. Stems numerous, freely branching, diffuse or prostrate, 1 to 2 ft. long; leaves ½ to 1 in. long, pinnately parted into entire or sharply toothed segments; pods small, about 1 line broad, notched both above and below, thus appearing transversely 2-lobed or didymous, each lobe turgid and finely wrinkled.—South American weed, naturalized near dwellings in n. Cal.

C. procúmbens Gilib. Swine Cress. Pods notched above, obscurely didymous, strongly roughened and cristate-muricate.—Adventive at San Francisco; native of Eur. (C. ruelli All.)

24. **LEPÍDIUM** L. Pepper-grass

Low annuals, rarely perennials, with toothed or pinnatifid leaves and very small flowers (½ to 1 or 2 lines long). Petals white, rarely yellow, sometimes none. Stamens 6, 4 or 2. Pod an orbicular, ovate or broadly oblong silicle, strongly obcompressed, and commonly notched or lobed at the more or less winged apex; valves acutely carinate, the cells 1-seeded. Style present or none. (Greek lepidion, a little scale, the pods flattened.)

A. Style distinctly developed and persistent.

Pods not notched at apex or indistinctly notched.
Flowers yellow; pods orbicular ..... 1. *L. jaredi.*
Flowers white.
Pods cordate; leaves ovate to ovate-lanceolate, denticulate, auriculate-clasping at base ..... 2. *L. draba.*
Pods elliptic; leaves deeply toothed or pinnatifid, petioled ..... 3. *L. montanum.*
Pods notched at apex.
Flowers white or nearly so.
Herbage pubescent; annual or biennial herbs.
Pods thick, winged; upper leaves oblong, sagittate-clasping, denticulate .... 4. *L. campestre.*

Pods thin, not winged, merely notched at apex; upper leaves cordate-clasping, entire.....5. *L. perfoliatum.*
Herbage glabrous; perennial herbs; leaves not clasping, the upper ones linear; desert species.
Stems woody below; silicle obcordate.....6. *L. fremontii.*
Stems herbaceous; silicle oval.....7. *L. alyssoides.*
Flowers bright yellow; plant prostrate.....8. *L. flavum.*

B. Style none, the stigma sessile or subsessile; annuals.

Pods notched but not winged.
Pedicels terete or only slightly flattened.
Plants prostrate or diffuse; petals none; leaves pinnatifid, the lowest bipinnatifid. 9. *L. bipinnatifidum.*
Plants erect.
Petals none; var. californicum of.....10. *L. virginicum.*
Petals present.
Cauline leaves oblanceolate, dentate, the basal sometimes pinnatifid with ovate-acute segments.....10. *L. virginicum.*
Cauline leaves pinnate or bipinnate with ovate or lanceolate segments.. 11. *L. robinsonii.*
Pedicels very much flattened.
Herbage hirsutulose; petals minute or none; pods pubescent, at least on the margins.....12. *L. lasiocarpum.*
Herbage glabrous or sparingly pubescent; petals present; pods glabrous..... 13. *L. nitidum.*
Pods winged at apex with two lobes or teeth and
Conspicuously reticulate; dwarfs with mostly prostrate or decumbent stems; wings or teeth approximate or parallel and
Nearly as long as the body.....14. *L. latipes.*
Very short..... 15. *L. dictyotum.*
With finer reticulations, the teeth divergent.....16. *L. oxycarpum.*

1. **L. járedi** Bdg. Slender glaucous pubescent annual 4 to 8 in. high, with narrow lanceolate entire or somewhat toothed leaves and branched rather loose inflorescence; pedicels filiform, 5 lines in length; flowers yellow, a little over 1 line long; pods glabrous, not retuse until by incipient dehiscence.—Goodwin, San Luis Obispo Co.; Riverdale, Fresno Co.

2. **L. dràba** L. HOARY CRESS. Perennial from deep-seated roots; herbage grayish; stems several from the ground, 12 to 16 in. high, leafy below, branching above and bearing a panicle of racemes; leaves large, ovate, sagittate-clasping at base and with scattered minute teeth on the margin; pods somewhat cordate, neither winged nor notched at apex.—Garden plant, nat. from Eur. Var. AURICULÀTUM Thell. Leaves narrow; pod elliptic, pubescent.—Los Angeles.

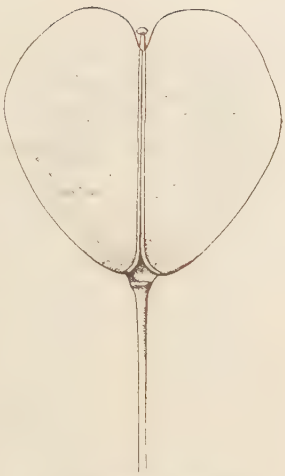
3. **L. montànum** Nutt. Biennial; stem branching above or often from the base, 10 to 14 in. high; herbage minutely pulverulent to shortly hirsute; leaves pinnatifid (sometimes bipinnatifid), the segments ovate to oblong-elliptic or rarely linear; upper leaves toothed or rarely entire; flowers in dense racemes; pods elliptic, varying to ovatish or orbicular, obscurely notched at apex, 1 to 1½ lines long, on spreading pedicels twice as long.—Mountain valleys, Siskiyou Co. (rare in Cal.); n. to Ore., e. to Col. and Tex.

4. **L. campéstre** R. Br. POOR-MAN'S PEPPER. Annual or biennial; stems 1 or several from the base, erect, 9 to 14 in. high, very leafy up to the inflorescence; herbage hoary-pubescent; cauline leaves oblong, mostly sagittate-clasping, denticulate, crowded, 1 to 3½ in. long; basal leaves pinnately lobed, long-petioled; pedicels horizontally spreading, equaling or a little shorter than the pods; pods broadly ovate, thick, squamulose, winged all around, 2½ lines long; style scarcely exserted from the narrow notch at apex.—European species, locally established in the Lake Tahoe region.

5. **L. perfoliàtum** L. Diffusely branching, 1 to 2 ft. high; lower leaves bipinnatifid with linear lobes; upper leaves round-ovate, cordate-clasping, entire; pedicels spreading; pods rhombic-orbicular, minutely notched.—Introd. from Eur., sparingly naturalized.

6. **L. frémóntii** Wats. Fig. 424. Rounded low evergreen bush, the stems woody below, ¾ to 2 ft. high; herbage glabrous and glaucous; leaves narrow, linear, acute, 1 to 2 in. long, entire or with 1 or 2 pairs of linear salient lobes or teeth; racemes very numerous; flowers on slender spreading pedicels;

petals 1½ to 2 lines long; pods thin, light-colored, shallowly obcordate with broad rounded lobes, rounded or often pointed at the base, 3 lines long.—Arid rocky slopes, abundant in the Mohave Desert, s. to the Colorado Desert, n. to Inyo Co.; e. to Col.



424. Lepidium fremontii Wats.; pod x 5.

7. **L. alyssoìdes** Gray. Stems several from a perennial base; herbage glabrous; leaves linear, entire, ½ to 1 or 1¼ in. long or the lower ones pinnately parted into 5 to 11 oblong or oval entire or incised lobes about 1 line long; racemes dense, white-flowered; flowers about 1 line long; fruiting pedicels 2 to 3 lines long; pods oval, 1 line long.—Plains and mesas, e. Mohave Desert; e. to Col. and Tex.

8. **L. flàvum** Torr. YELLOW PEPPER-GRASS. Prostrate or decumbent annual, 4 to 16 in. broad, very brittle at the joints; herbage glabrous, yellow-green; leaves slightly fleshy, the basal rosulate, oblong-oblanceolate in outline, regularly pinnatifid with short rounded lobes and narrow acute sinuses, the cauline oblanceolate to obovate, pinnatifid, sparingly toothed, or entire; racemes short and dense, subcapitate; pods glabrous, finely reticulated, bifid at the apex, the teeth acute, the sinus open; style half as long as the body of the pod.—Sandy bottoms of desert washes or dry pool beds: Mohave and Colorado deserts and Inyo Co.; Nev. to Mex. Mar.-Apr.

425. Lepidium bipinnatifidum Desv.; pod x 5.

9. **L. bipinnatifidum** Desv. WAYSIDE PEPPER-GRASS. Fig. 425. Stems 3 to 6 in. long, freely branching from the base, diffuse or even prostrate, the plants often closely matting the ground; herbage light green, puberulent or glabrate; leaves pinnatifid or the lowest bipinnatifid; racemes numerous, dense and rather narrow; petals none; pods round, nearly 1½ lines long, glabrous, faintly reticulate, the teeth at the apex short and obtuse; fruiting pedicels ascending, ½ to 1 line long.—Common in hard beaten soil by paths and waysides, Coast Ranges and Great Valley; nat. from S. Am.

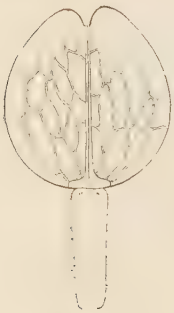
10. **L. virgínicum** L. TALL PEPPER-GRASS. Fig. 426. Stem erect, ¾ to 2 ft. high, simple below, paniculately branching above and bearing numerous racemes 2 to 8 in. long, rarely with several stems from the base; herbage glabrous to sparingly pubescent; leaves oblanceolate, varying to narrow-ovate, sharply serrate (the basal sometimes pinnatifid), narrowed at base to a petiole, 1 to 3 in. long; rameal leaves linear, serrate only towards the apex or entire, shorter; petals white; stamens 2; pods orbicular or nearly so, 1½ lines long, notched at the very narrowly winged apex; pedicels 1½ to 2 lines long, widely (or even horizontally) spreading.—Moist valleys and stream bottoms throughout Cal.; e. to the Atlantic. It passes into the var. PUBÉSCENS Thell. Herbage and pods roughish pubescent.—Providence Mts. Var. CALIFÓRNICUM Jepson n. var. Stems usually several from the base; herbage puberulent to almost glabrate; petals none; stamens 2.—E. Cal., especially in the desert region (Barstow, Jepson 6623).

426. Lepidium virginicum L.; pod x 5.

11. **L. robinsònii** Thell. Stems branching, commonly several from the base, diffuse or ascending, 4 to 10 in. long; herbage pubescent; leaves once or twice pinnatifid with ovate or oblong acute lobes; racemes and pods similar to L. lasio-

carpum, but the latter glabrous.—Cismontane S. Cal. Perhaps only a leaf form of L. lasiocarpum.

12. **L. lasiocárpum** Nutt. Stems many from the base, decumbent or ascending, 3 to 6 (or 10) in. long; herbage hirsutulose or hirsute; leaves obovate to oblanceolate, toothed, incised or less commonly pinnatifid; racemes many; pedicels distinctly flattened, horizontally spreading, 1½ lines long; sepals broadly oblong, usually purple, with thin white margins; petals minute or none; pods suborbicular, thin-margined near the apex, hispid-pubescent upon both faces or at least upon the edge, or sometimes (especially near the coast) quite glabrous.—Coast of S. Cal.; Colorado and Mohave deserts; Inyo Co.; e. to Tex., s. to Mex.



427. Lepidium nitidum Nutt.; pod x 5.

13. **L. nítidum** Nutt. Common Pepper-grass. Tongue-grass. Fig. 427. Branching from or near the base, 1 to 10 in. high, the branches mostly simple; herbage glabrous or sparingly pubescent; leaves ½ to 4 in. long, pinnatifid with rachis ligulate and bearing entire or laciniately toothed discrete lobes, the terminal lanceolate lobe often enlarged or prolonged; upper leaves often entire; petals white, less than 1 line long, obovate, without distinct claw; stamens 6, but the 2 shorter mere rudiments; pods round with a narrow margin, abruptly notched at apex, 1½ to 2 lines long, plane on the upper face, convex on the lower, glabrous and shining, often dark purple.—Common everywhere on the Cal. plains, low hills and in the valleys; n. to Wash. Feb.-Apr.

14. **L. látipes** Hook. Dwarf Pepper-grass. Fig. 428. Stems 1 to several from the base, very thick and stout, 1 to 2 in. long, recurved-prostrate or erect; herbage slightly pubescent; leaves 3 to 5 in. long, linear and entire, or pinnatifid with few segments, the segments remote, lanceolate or linear, often toothed, 3 to 7 lines long, the rachis ligulate, commonly dilated into a terminal lanceolate lobe; racemes very dense, often capitate, ½ to 1¼ in. long; petals broadly spatulate, greenish, rounded at the apex, 1 line long, much exceeding the short sepals; pods broadly oblong or oval, 2½ to 3 lines long, 2 lines broad, strongly reticulated, sparingly pubescent or glabrous, winged at apex with two broad acute teeth nearly as long as the body, the sinus between the teeth or wings a narrow cleft.—Alkaline flats, beds of winter pools or balsas on the plains or in the valleys: Coast Ranges and Great Valley to coastal S. Cal. Mar.-May.

428. Lepidium latipes Hook.; pod x 5.

15. **L. dictyòtum** Gray. Fig. 429. Branches several or numerous from the base, decumbent, or at length ascending, 1 to 7 in. long; leaves pinnate with ligulate rachis and few remote linear segments, or quite entire; herbage hirsutulose; raceme rather dense with ascending flattened pedicels; petals little exceeding the sepals or wanting; pods elliptic, finely reticulated, pubescent or glabrous, 1½ to 2 lines long with short obtuse wings or teeth at the summit, the sinus narrower, linear.—Alkaline soils: Livermore and San Joaquin valleys to S. Cal.; Ore., Wash. and Ida. Mar.-Apr.

429. Lepidium dictyotum Gray; pod x 5.

16. **L. oxycárpum** T. & G. Fig. 430. Stems very slender, branched from the base, the branches elongated, erect or ascending, 4 to 6 in. long, bearing flowers more than half their length; leaves narrow, linear and subentire, or pinnate with a few acute linear segments; sepals very unequal, caducous, ½ line long; petals none; stamens 2; pods roundish, glabrate,

430. Lepidium oxycarpum T. & G.; pod x 5.

finely reticulated, 1¼ lines long, tipped with 2 very short and acute widely divergent teeth; sinus rounded but often triangular; pedicels widely spreading or retrocurved, very slender, flattened, 1 to 1½ lines long, often longer than the pod.—Borders of salt marshes or in alkaline soils, San Francisco Bay region. Var. ACÙTIDENS Jepson n. comb. Fig. 431. Raceme elongated, loose, the pedicels erect or spreading; pods glabrous or slightly pubescent, lightly reticulated, 2 to 2½ lines long, the teeth at apex widely divergent, lanceolate and wing-like, commonly as long as the elliptic body; pedicels rather shorter than the pod.—Alkaline soil: San Diego Co.; Livermore Valley; lower San Joaquin Valley; Sacramento Valley; Lassen and Siskiyou Cos. (L. dictyotum var. acutidens Gray.)

431. Lepidium oxycarpum var. acutidens Jepson; pod x 5.

25. **SUBULÀRIA** L. Awlwort

Small aquatic perennials. Stem simple, scape-like, with a cluster of linear-subulate leaves at base. Flowers minute, white, loosely racemose. Stamens 6, scarcely unequal; anthers oval. Stigma sessile, slightly 2-lobed. Pod elliptic or obovate, scarcely flattened, the valves convex, 1-ribbed on the back. Seeds few, in 2 rows in each cell. (Latin subula, an awl, in reference to the leaves.)

1. **S. aquática** L. Stems 1 to 4 in. high, arising from a dense cluster of bright white root fibers; leaves unequal, erect or slightly spreading, thickish at the base, ½ to 1½ in. long; scape flowering from below the middle, the submersed flowers minute, cleistogamous; pods 1 to 1½ lines long, upon short spreading pedicels.—Submersed or growing on muddy banks of ponds, lakes or running water: Sierra Nevada from Mono Co. to Sierra Co., 7000 to 10,000 ft.; n. to Brit. Am.; Eur., Asia.

26. **PLATYSPÉRMUM** Hook.

Low glabrous annual with the leaves in a basal rosette. Flowers minute, solitary on naked scapes. Sepals equaling the white petals. Pod suborbicular, flattened parallel to the broad partition. Seeds reticulated, broadly winged, in 2 rows. (Greek platys, broad, and sperma, seed.)

1. **P. scapígerum** Hook. Fig. 432. Scapes 1 to 4½ in. high; leaves lyrately pinnatifid with few lobes or reduced to a single ovate or rhombic lobe; pods 3 to 6 lines long, 8 to 12-seeded.—Moist gravelly places in montane valleys from Sierra Co. to Siskiyou Co.; Nev. to Ida.

432. Platyspermum scapigerum Hook.; *a*, habit x ½; *b*, fl. x 2½; *c*, seed x 2.

27. **ALÝSSUM** L.

Low branching herbs with small white or yellowish flowers. Pod ovate, oblong or orbicular, flattened; cells 1 or 2-seeded. Cotyledons accumbent. (Greek, a, without, lussa, madness, in ancient times an antidote for hydrophobia.)

Pubescence of simple appressed hairs; pods marginless, pointed.....1. *A. maritimum.*
Pubescence stellate; pods narrowly margined, slightly emarginate above.....
2. *A. alyssoides.*

1. **A. marítimum** (L.) Lam. SWEET ALYSSUM. Perennial; leaves narrowly lanceolate or linear; flowers white, 2 lines long; petals twice as long as the deciduous sepals; filaments not toothed; pods orbicular, 2-seeded.—Garden plant from Eur., occurring as an escape.

2. **A. alyssoides** L. SMALL ALYSSUM. Annual; petals yellowish white, scarcely exceeding the sepals; sepals persistent about the base of the fruit; filaments of the shorter stamens toothed at base.—Garden plant from Eur., nat. in Siskiyou Co., at one time adventive in the San Francisco Bay region.

28. **CAPSÉLLA** Medic.

Slender annuals with pinnatifid leaves and small white flowers. Petals small, little exceeding the sepals. Pod obcordate or elliptical, strongly or scarcely at all flattened, several-seeded; valves carinate. Seeds not winged; cotyledons incumbent. (Latin capsella, a little box.)

Pods obcordate, or cuneate-triangular in outline with retuse apex, strongly flattened..... 1. *C. bursa-pastoris.*

Pods elliptic-oblong, scarcely flattened, entire at the apex.....2. *C. procumbens.*

1. **C. bursa-pastòris** (L.) Moench. SHEPHERD'S PURSE. Stems erect, simple or branching, 3 to 18 in. high, sparsely hispid; basal leaves in a spreading rosette; lower leaves petioled, pinnatifid, rarely entire, the terminal lobe largest; upper leaves merely dentate, sessile-auriculate; petals ¾ to 1½ lines long; pedicels elongating in fruit, 4 lines long; pods obcordate, 2½ to 3 lines broad, many-seeded, strongly flattened.—Common in pastures, orchards and by waysides; nat. from Eur. Variable in foliage and shape of pod.

2. **C. procúmbens** (L.) Fries. Stems several from the base, erect or ascending, 3 to 6 in. high; leaves oblanceolate or spatulate, or the lower or all more or less pinnatifid; flowers minute, ½ line long or less; sepals ovate-elliptic, thin-margined, about equaled by the petals; pods elliptic-oblong, entire at the apex, 1 to 1½ lines long; pedicels filiform, in fruit 2 to 4 lines long and divaricately spreading.—Alkaline soil: S. Cal. to Alameda, Tulare, and Inyo Cos.; n. to B. C.; Eur., Asia.

29. **CAMÉLINA** Crantz

Erect annual with sagittate-clasping leaves. Flowers small, light yellow, in a loose raceme. Pods obovate or pear-shaped, beaked with the persistent style; valves convex with flattened edges forming a narrow margin; seeds several in each cell; cotyledons incumbent. (Greek camai, dwarf, and linon, flax.)

1. **C. satìva** Crantz. FALSE FLAX. Stem simple or branching above, 1 to 3 ft. high, leafy, nearly glabrous; leaves oblong to lanceolate, entire or dentate; pods 3½ to 4 lines long, 2 to 2½ lines broad.—Old World weed of grain fields, occasional in Cal. The seeds were used as a source of oil in Europe before the introduction of cottonseed oil (Erythea 2:157).

30. **DRÀBA** L.

Low herbs with a pubescence of simple, forked or stellate hairs. Flowers white or yellow, in racemes. Petals entire, notched or bifid. Style short or slender; stigma simple or very slightly lobed. Pod oval to oblong or linear-oblong, flat; partition thin-membranous. Seeds in 2 rows, neither margined nor winged. Cotyledons accumbent or rarely incumbent. (Greek drabe, a name of Dioscorides for some cress.)

A. Annuals; lower altitudes (except no. 4).

Petals not entire; pods straight.
Petals deeply 2-cleft; flowers white; pods glabrous.....1. *D. verna.*
Petals retuse,
Little exceeding the sepals; flowers yellowish, becoming white; pods puberulent..
2. *D. nemorosa.*
Nearly twice as long as the sepals; flowers white; pods pubescent or glabrous...
3. *D. cuneifolia.*
Petals entire, obtuse or truncate; flowers yellow; pods glabrous, usually a little curved...
4. *D. stenoloba.*

B. Perennials; alpine or subalpine plants with branched densely leafy caudex.

Leaves not carinate, soft.
Style ¼ to ¾ line long.
Flowers yellow; leaves loosely or thinly pubescent or ciliate.
Flowering stems leafy; leaves oblong-linear; pods pubescent, not twisted... 5. *D. aureola.*
Flowering stems naked; leaves broadly spatulate or oblanceolate.
Leaves ciliate, surface hairs simple or forked; branches of caudex densely leafy throughout; pods pubescent or glabrous, undulate or twisted.....6. *D. lemmonii.*
Leaves stellate-pubescent, not ciliate; branches of caudex leafy only at tip; pods glabrous, not twisted.....7. *D. nivalis.*
Flowers white; flowering stems few leaved; leaves oblong, canescent; pods pubescent, often twisted; stigma subsessile.....8. *D. breweri.*
Style 1 to 2 lines long.
Flowering stems mostly with reduced leaves, commonly much branched; corolla pale yellow, about 1 line long.....9. *D. corrugata.*
Flowering stems naked, simple; corolla deep yellow, 2 to 4 lines long..... 10. *D. howellii.*
Leaves carinate by the prominent midnerve, becoming rigid with reflexed margin.
Racemes produced beyond the leaves; pods mostly flattened.....11. *D. glacialis.*
Racemes mostly hidden by the leaves; pods about as thick as broad..12. *D. douglasii.*

1. **D. vérna** L. WHITLOW GRASS. Stems 2 to 4 (or 6) in. high, naked, several from a rosulate cluster of leaves; leaves ovate or oval, toothed near the apex, sessile or nearly so, 2 to 6 lines long; petals cleft nearly or quite to the middle, 1 line long, nearly twice as long as the acutish sepals; pod oval, 2 to 3 lines long.—Lake Co. to Siskiyou Co.; introd. from Eur.

2. **D. nemorósa** L. Stems slender, several from the base, 1¾ to 4 (or 12) in. high; pubescent below; leaves basal and sub-basal but rarely rosulate, ovate to oblong-lanceolate, 2 to 9 lines long; slightly dentate; stems usually flowering from near the base; flowers yellow, becoming whitish, petals slightly retuse; calyx somewhat villous; pods elliptic- to narrow-oblong, minutely pubescent, 2½ to 6 lines long, much shorter than the divaricate pedicels (6 to 9 lines long).—Thickets and woods, Siskiyou Co.; n. to B. C., e. to Ont.; Eur., Asia.

3. **D. cuneifólia** Nutt. Stems several to many from the base, ascending or diffuse, 2 to 10 in. high; leaves basal (or mostly basal), oblanceolate to obovate, entire or serrately few-toothed, stellate-pubescent, ¼ to 1¼ in. long; racemes rather dense, borne on mostly naked stems commonly as long or longer; pods linear-oblong to narrow-elliptic, pubescent (the hairs forked or occasionally simple) or glabrous, 3 to 6 lines long, exceeding the pedicels.—Dry sandy soil, Colorado Desert; e. to Tex. and Ill. Var. INTEGRIFÒLIA Wats. Stems 1 to several from the base, flowering from near the base, usually with a few leaves below as well as basal; racemes loose, commonly longer than in the species; pods as in the species or glabrous.—Dry sandy soil of the foothills and valleys of cismontane S. Cal.; e. to Ariz.; s. to Mex. Var. CALIFÓRNICA Jepson n. var. Stems strictly erect, nearly naked, flowering from about the middle or a little below, 3 to 5½ in. high, the leaves in a dense basal tuft; herbage and pods puberulent; petals obtuse or obscurely notched; pods oblong-lanceolate, 3 to 3½ lines long, ascending.—North Fork Crooked Creek, White Mts., Inyo Co. (Jepson 7261, type).

433. Draba stenoloba Ledeb.; *a*, habit x ½; *b*, fl. x 2½; *c*, fr. branchlet x ½; *d*, pod x 2.

4. **D. stenóloba** Ledeb. Fig. 433. Stems several from a basal tuft, erect or lax, 5 to 13 in. high, ¾ to 3 (or 5) in. high in dwarf forms; herbage more or less villous and the leaves often ciliate; leaves mostly in a subrosulate basal tuft, oblong-obovate or oblanceolate, thin, ½ to ¾ (or 1½) in. long (or only 2 to 3 lines long in the alpine dwarfs), the one or two cauline ones ovate to oblong-lanceolate; fruiting raceme very open; flowers yellow, becoming white in age; sepals glabrous or sparingly pilose; petals entire, obtuse or truncate, sometimes purplish; pods linear, usually a little curved, acute, glabrous, 4 to 7 lines long, equal to or shorter than the spreading or divaricate pedicels.—Subalpine, 7000 to 12,000 ft.: Sierra Nevada from Tulare Co. to Modoc Co.; White Mts.; e. to Rocky Mts., n. to Alas.

5. **D. aurèola** Wats. Fig. 434. Stems simple, 2 to 4 in. high, crowded with leaves at base, arising from a simple or branched caudex; herbage rather densely stellate-pubescent throughout; basal leaves oblanceolate, obtuse, entire, 6 to 8 lines long, the cauline oblong, shorter; flowers yellow; raceme densely crowded in flower and fruit; calyx glabrous; pods broadly oblong, obtuse, pubescent, not twisted, 4 to 5 lines long, on spreading pedicels 2 to 3 lines long; style short (½ line long), stout.—Known only from three volcanic peaks (7000 to 11,000 ft.): Lassen Peak, Cal.; Three Sisters, Ore.; Mt. Rainier, Wash.

434 Draba aureola Wats.; *a*, habit x ½; *b*, fl. x 2½; *c*, pod x 2.

6. **D. lemmònii** Wats. Scapes 1 to 3¼ in. high, pilose or glabrous, rising from a compact leafy cushion of the much-branched caudex; leaves thick, spatulate to oblong-obovate, mostly very obtuse, conspicuously ciliate, the surface glabrous or sparingly hirsutulose with simple or forked hairs, 2 to 5 lines long; raceme short; flowers yellow, 2 lines long; sepals somewhat villous or subglabrous; pods ovate to broadly lanceolate, more or less undulate or twisted, pubescent or glabrous, 3 to 4 lines long, on slender spreading pedicels 1 to 2 or 4 lines long.—Alpine peaks in the Sierra Nevada from Alpine Co. to Tulare Co., 9000 to 13,000 ft., rooting in clefts of rocks; w. Nev. to e. Ore.

7. **D. nivàlis** Lilj. var. **californica** Jepson n. var. Caudex rather loosely branched, its branches of the season producing a rosette of leaves at apex and the next season slender, naked flowering stems, 3 to 4 in. high; leaves oblanceolate, acutish, obscurely repand, usually with a pair of short teeth toward the apex, slightly thickened, thinly stellate-pubescent, not ciliate, 3 to 7 lines long; flowers bright yellow, 2½ lines long; sepals ½ line long, glabrous, thinly margined, yellow; stamens less than ½ the length of the petals; pods linear-lanceolate, acuminate, generally slightly oblique, glabrous, 4½ lines long; style slender, ¼ to ½ line long.—Mineral King, Tulare Co., 9000 ft. (T. Brandegee, type).

8. **D. bréweri** Wats. Alpine dwarf, the stem 1 to 4 in. high, arising from a densely leafy cushion; herbage hoary throughout with a dense stellate pubescence; basal leaves oblong, obtuse, entire or rarely sparingly toothed, 2 to 4 lines long; the cauline ones few, oblong-ovate; flowers white, 1 to 1½ lines long; sepals oblong; pods linear-oblong, obtusish, often twisted, pubescent, 2 to 3 lines long, on short ascending pedicels; stigma sessile or nearly so.—Alpine rocky slopes and summits, 12,000 to 13,000 ft.: Sierra Nevada from Siskiyou Co. to Tulare Co.; White Mts. Var. SUBLÁXA Jepson n. var. Stems 4 to 7 in. high; pubescence thinner; lower leaves less crowded, oblance-

olate, toothed or entire, thinner, 6 to 9 lines long; pods oblong-lanceolate to lanceolate, acute or acuminate, 3 to 4 lines long.—Saddle between Mt. Dana and Mt. Gibbs (Chesnut & Drew, type).

9. **D. corrugàta** Wats. Fig. 435. Stems several from the crown of a simple or somewhat branched root-crown, 2 to 9 in. high; herbage loosely pubescent with branching hairs; leaves in a dense basal tuft, few or much reduced on the flowering stems, oblong-oblanceolate to narrow-obovate, obtusish, entire, ¼ to 1 (or 2) in. long; flowers pale yellow; sepals pubescent; petals narrowly linear-cuneate, 1¼ lines long, notched at apex; pods lanceolate to broadly oblong, acute or obtuse, pubescent, much corrugated and twisted, 2 to 5 lines long on pedicels 1 to 5 lines long; style 1 line long. —Alpine at 9500 to 11,500 ft., but descending to forest areas at 8000 ft.; San Gabriel, San Bernardino and San Jacinto mountains.

435. Draba corrugata Wats.; *a*, habit x ½; *b*, infl. x ½; *c*, fl. x 2½; *d*, pod x 2.

10. **D. howéllii** Wats. Flowering stems naked, 2 to 4 in. high, arising from the densely leafy cushion of a much-branched caudex; herbage finely soft-pubescent throughout; leaves in very dense rosettes, broadly spatulate or oblong, mostly very obtuse, 1½ to 2 lines long; flowers large (3 to 4 lines long), in a loose raceme, deep yellow; pods oblong, often somewhat oblique or subfalcate, acute at each end, pubescent, 2 to 4 lines long, the style slender, 1 to 1½ lines long; pedicels 2½ to 4 lines long.—Siskiyou Mts.; Marble Mt.

11. **D. glaciàlis** Adams. Fig. 436. Flowering stems naked, slender, ¼ to 2½ in. high, pilose or glabrate, few-flowered, arising from the dense cushion of the much-branched caudex; leaves linear, in dense terminal rosettes on the branches of the caudex, 1 to 2 (or 3) lines long, mostly grayish pubescent; flowers yellowish, fading white; sepals sparingly villous or glabrous; pods ovate to ovate-oblong, acute, rounded (or sometimes acute) at base, strongly flattened or rarely a little thickened, usually finely pubescent, 1 to 3 lines long, on pedicels 1 to 6 lines long; style ¼ to ½ line long; seeds 2 to 4 or 6.—Alpine summits and high ridges, in rocky places, 11,600 to 13,300 ft.: Sierra Nevada from Mariposa Co. to Placer Co.; White Mts., Inyo Co.; e. to Rocky Mts., n. to B. Am.; Eur., Asia. Var. PECTINÀTA Wats. Taller (3 to 4½ in. high) and with greener glabrous ciliate-pectinate leaves.—Castle Peak, Nevada Co.; Mt. Lola; Lake City Pass, Modoc Co.

436. Draba glacialis Adams; *a*, habit x 1; *b*, fl. x 2½; *c*, pod x 2.

12. **D. douglásii** Gray. Flowering stems ½ to 1 in. high, arising from

the crown of a branched and densely leafy caudex; leaves narrowly linear, firm or even somewhat cartilaginous, pubescent, or glabrate except the ciliate margins, 3 to 6 lines long; flowers white; pods ovate, acuminate, 1½ to 2 lines long, pubescent with simple hairs; valves becoming strongly convex; style slender, ½ to 1 line long; ovules 2 (rarely 4) in each cell, pendent from near the apex of the cells; seeds large.—Alkaline or wet places in high mts., rare: San Bernardino Mts.; Nev. to Wash.

31. **ATHÝSANUS** Greene

Low annual, leafy below, the short stem divided at or near the base into few or many simple elongated filiform branches or racemes which are unilaterally flower-bearing throughout. Herbage pubescent with 2 to several-forked spreading hairs. Flowers minute, promptly reflexed or recurved. Petals linear or none. Stamens 6, nearly or quite equal; filaments slender. Pod small, orbicular, indehiscent, or dehiscent only after falling, 1-celled, or 2-celled by a thin partition, wingless; cotyledons accumbent (Greek a, without, and thusanos, fringe, the fruit wingless.)

Pods plane, numerous on the racemes; seed 1 . . . . . 1. *A. pusillus.*
Pods twisted at maturity; racemes lax, the pods often distant 1 in. or more; seeds mostly 8 to 11, the valves eventually separating . . . . . 2. *A. unilateralis.*

1. **A. pusíllus** (Hook.) Greene. Fig. 437. Plants 4 to 6 or 12 in. high; racemes 3 to 9 in. long; leaves broadly oblong, nearly entire or with 1 to 3 coarse teeth on each side, 2 to 5 (or 12) lines long; flowers ⅔ line long, on pedicels twice as long; ovary 1-celled; ovules 2 to 4, only one maturing, that attached at base of the pod; fruiting pedicels recurved, 1 to 3 lines long; pods orbicular, strongly flattened, ¾ to 1 line long, hispid all over with hooked hairs.—Gravelly plains and foothills, 50 to 4000 ft.: cismontane S. Cal.; Sierra Nevada; Coast Ranges; n. to B. C. and Ida. Common.

437. Athysanus pusillus Greene; *a*, habit x 1; *b*, *c*, leaf variations x 1; *d*, pod x 4½.

2. **A. ùnilaterâlis** (Jones) Jepson. Stem short; racemes lax, diffuse, or horizontal and trailing, in age rigid and wiry, 6 to 18 in. long; leaves cuneate-obovate to oblanceolate, 4 to 12 lines long, few-toothed or entire; flowers 1 line long on pedicels ½ as long; pods round-oval, 1 to 2½ lines long, hispidulous, twisted when mature, the pedicels thick, recurved, ½ to 1 line long.—Hillsides and valleys of the inner Coast Ranges from w. Fresno Co. to w. Colusa Co.; s. to L. Cal., n. to Ore. Apr.

32. **THYSANOCÁRPUS** Hook.

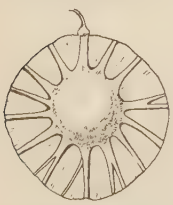
Slender erect annuals. Flowers minute, white or purplish. Sepals ovate, spreading. Petals spatulate. Stamens 6, subequal, with slender filaments. Ovary 1-celled, 1-ovuled, becoming an indehiscent fruit. Pod much flattened and winged, orbicular in outline, the body disk-shaped or plane on one side and convex on the other, the wing with small holes or perforations or with radiating nerves ("rays") or toothed. (Greek thusanos, fringe, and karpos, fruit.)

Fruiting pedicels more or less recurved their whole length; rays of the wing broad.
Leaves oblong-lanceolate, the basal rosulate, pinnatifid or toothed . . . . . 1. *T. curvipes.*
Leaves linear to oblong-linear, the basal entire or with divaricate salient segments, not rosulate . . . . . 2. *T. laciniatus.*
Fruiting pedicels straight or recurved only at tip; rays of the wing linear . . . 3. *T. radians.*

1. **T. cúrvipes** Hook. FRINGE-POD. Fig. 438. Slender, 1 to 1½ ft. high, more or less pubescent or hirsute; cauline leaves linear or lanceolate, sessile and auricled at base, the upper entire, the lower dentate or denticulate; basal leaves often narrowed at base to a petiole, commonly sinuate-pinnatifid, with triangular acute or acuminate lobes; pods obovate varying to round-obovate, pubescent or glabrous, 1½ to 3½ lines long, often very convex on one side; wing narrow, rather crowded with broad rays, entire.—Frequent in the open hill country of Cal., 100 to 5000 ft.: n. to B. C. and Ida. Var. ERADIÀTUS Jepson n. var. Wing of pod membranous, without rays. —Deserts, Inyo Co. (Panamint Range, Jepson 7040, type) s. to the Colorado Desert. Var. LONGÍSTYLUS Jepson n. var. Style ½ to ¾ line long (in the species ⅛ to ⅕ line long), persistent. —Sierra Nevada, 3000 to 3500 ft., from Mariposa Co. to Tulare Co. (Jepson, type). Var. ÉLEGANS Rob. Lace-pod. Stem rather stout, with few branches, 14 to 22 in. high; lower leaves repand-toothed or entire; pod nearly orbicular, 3 to 4½ lines long, the body densely tomentose or glabrous; wing with large ovoid perforations between the rays (or sometimes non-perforate), the margin membranous and entire.—Foothills throughout cismontane Cal. (T. elegans F. & M.)

438. Thysanocarpus curvipes Hook.; *a*, fr. branchlet x 1; *b*, base of plant x 1; *c*, pod x 2.

2. **T. laciniàtus** Nutt. Stems 8 to 15 in. high; herbage glabrous or the stems sometimes sparingly hirsutulose; leaves thinner than in nos. 1 and 3, linear, subentire or deeply pinnatifid into remote narrowly linear segments, those near the base not forming a dense or persistent rosette; racemes 1 to 8 in. long; pods obovate, elliptic or orbicular, distinctly reticulated, commonly but not always glabrous, 1 to 2 lines long; wing entire, crenate-toothed or perforated; pedicels slender, spreading and deflexed.—Open hills, 50 to 1500 ft.: S. Cal.; South Coast Ranges; e. to Ariz., s. to L. Cal. It passes by intergrades into the next var. Var. EMARGINÀTUS Jepson n. comb. Cauline leaves not auricled; pods nearly circular, 2 to 2½ lines long, glabrous, the wing scarious, destitute of radiating nerves or these very short, deeply or slightly emarginate at the apex.—Inner Coast Range; Sierra foothills in Calaveras Co. (T. emarginatus Greene.) Var. CRENÀTUS Brew. Wing notched between the ends of the rays.—South Coast Ranges and S. Cal. Var. CONCHULÍFERUS Jepson n. comb. Four to 8 in. high; herbage glabrous, glaucous; leaves linear or lance-linear, sagittate-auriculate, runcinately toothed or parted; teeth 2 to 4 pairs; racemes densely many-flowered, 1 to 2 in. long; pedicels 2 to 3 lines long, spreading, little recurved; pods markedly boat-shaped, glabrous; wing parted into spatulate lobes or the lobes coherent above leaving oblong perforations.—Santa Cruz Isl. (T. conchuliferus Greene.)


439. Thysanocarpus radians Benth.; pod x 2.

3. **T. ràdians** Benth. Fig. 439. Stems ½ to 1½ ft. high; basal leaves runcinate-pinnatifid, the cauline ovate-lanceolate, auriculate-clasping; pods orbicular, 4 lines broad, glabrous or tomentose, the edge of the body divided into radiating spoke-like nerves which disappear abruptly just within the margin of the white-membranous wing; pedi-

cels straight, spreading, abruptly recurved at the very summit.—Low hills or rolling plains, infrequent, but widely distributed in the North Coast Ranges and in the Sacramento Valley and bounding foothills. Apr.-May.

SARRACENIÀCEAE. Pitcher Plant Family

Herbs. Leaves basal, with pitcher-like petioles and lid-like blades, the cavity containing a liquid with properties similar to gastric juice. Flowers borne on a scape. Sepals 5, persistent. Petals 5. Stamens many. Ovary superior, 3 to 5-celled. Fruit a loculicidal capsule. Seeds numerous.

1. DARLINGTÓNIA Torr.

Scapes 1-flowered, the flower pendulous. Petals with a small ovate tip (the blade) and a larger elliptic or oblong lower portion (the claw). Sepals rotate. Stamens 13 to 15, in a single circle. Stigmas 5, rotate on a short style which arises from the umbilicate-truncate apex of the ovary. (William Darlington, 1782-1863, Pennsylvania botanist.)

440. Darlingtonia californica Torr.; *a*, habit x ¼; *b*, petal x ½; *c*, pistil x ½; *d*, stamen x 1½; *e*, capsule x ¼.

1. **D. califórnica** Torr. California Pitcher Plant. Calf's Head. Fig. 440. Plants greenish-yellow, ⅔ to 1¼ (or 3) ft. high; leaves enlarged upward into a rounded hood, one side of the hood with a circular orifice covered above by a 2-forked appendage; sepals yellowish-green with irregular purplish lineations, 1⅜ to 2 in. long; petals dark purple, heavily veined, narrow-ovate, 1⅛ to 1¼ in. long; stamens 3 lines long; ovary cuneate-obovoid; capsule obovatish-oblong, 1 to 1⅛ in. long.—Marshy meadows and along streams, 3000 to 6000 ft.: Plumas Co.; Shasta Co.; Siskiyou Co.; Del Norte Co.; n. along the Oregon Coast Range as far as Coquille Pt.

441. Drosera rotundifolia L.; *a*, habit x ½; *b*, leaf x 2; *c*, fl. x 2; *d*, petal x 4; *e*, pistil x 4.

DROSERÀCEAE. Sundew Family

Perennial glandular herbs of bogs. Leaves in a basal rosette. Flowers hypogynous, white. Ovary 1-celled; styles 1 to 5; ovules numerous on parietal placentae. Capsule 3-valved.

1. DRÓSERA L. Sundew

Herbage brownish or reddish. Leaves long-petioled, the blade covered with numerous stout glandular hairs. Flowers borne on a naked scape in a 1-sided raceme. Calyx 5-parted, persistent. Petals 5, distinct or slightly united, hypogynous. Stamens 5. Styles 2 to 5, usually 3, often 2-parted so as to appear twice as many. (Greek droseris, dewy, the glands dew-like.)

Leaf-blades orbicular or broader than long....1. *D. rotundifolia.*
Leaf-blades 4 to 8 times longer than broad....2. *D. longifolia.*

1. **D. rotundifòlia** L. Fig. 441. Scapes 3½ to 8 in. high; leaves spreading, suborbicular; petals only a little exceeding the sepals.—Marshy spots in the Sierra Nevada from Tulare Co. to Siskiyou Co., thence s. (near the coast) to Mendocino Co.; N. Am., Eur., Asia.

2. **D. longifòlia** L. Scapes 3 to 6 in. high; leaves erect, obovate-spatulate; petals nearly twice as long as the sepals.—Sierra Co. to Plumas Co.; n. to Brit. Am.; Eur., Asia.

CRASSULÀCEAE. Stone-crop Family

Succulent glabrous herbs. Leaves in ours entire, without stipules. Flowers in cymes or rarely solitary, small, regular, and usually perfect. Sepals, petals and pistils of the same number (usually 5 in ours), the stamens as many or twice as many. Petals generally somewhat perigynous, distinct or united into a short tube, usually persistent. Fruit consisting of free or somewhat united one to many-seeded follicles. Receptacle usually with nectar-bearing scales, one behind each pistil.

Leaves opposite; stamens as many as the petals; diminutive annuals....1. Tillaea.
Leaves alternate; stamens twice as many as the petals.
  Annuals; carpels 1-seeded....2. Sedella.
  Perennials; carpels several to many-seeded.
    Flowers solitary; root tuberous....3. Congdonia.
    Flowers many, in cymes.
      Flowering stems arising from corms....4. Hasseanthus.
      Flowering stems not arising from corms.
        Flowers imperfect; flowering stems arising from a short caudex; leaf rosettes none....5. Rhodiola.
        Flowers perfect; flowering stems arising from leaf rosettes.
          Petals commonly spreading, at least at tip; mostly mat-like plants with branching rootstocks....6. Sedum.
          Petals commonly erect, often closely approximate at tip; coarse plants with thick basal leaf rosettes borne on a simple or branched caudex....7. Cotyledon.

1. TILLAÈA L.

Diminutive much-branched glabrous annuals with opposite leaves. Flowers very small, clustered or solitary in the axils of the leaves, subsessile or short-pedicellate. Sepals, petals, stamens, and carpels 3 to 5 (in ours usually 4). Petals distinct, or united only at the very base. Carpels distinct, erect, 1 to 12-seeded. (Michael Angelo Tilli, Italian botanist.)

Flowers solitary in the axils; petals twice the length of the sepals; carpels 8 to 10-seeded; aquatic or of muddy bottoms....1. *T. aquatica.*
Flowers densely clustered in the axils; petals and sepals subequal; carpels 1 or 2-seeded; terrestrial....2. *T. erecta.*

1. **T. aquática** L. Stems usually decumbent and rooting at the lower nodes, rebranched, 1 to 3 in. long; leaves oblong, 2 to 3 lines long, connate; sepals ½ line long, twice exceeded by the greenish oblong petals; carpels 8 to 10-seeded.—Muddy ground, widely distributed in Cal., but not common; N. Am., Eur. Var. drummóndii Jepson n. comb. Pedicels elongating in fruit and finally exceeding the leaves.—Muddy places, uncommon in Cal.: Napa Valley; San Francisco; Lake Pilarcitos, San Mateo Co. (T. drummondii T. & G.)

2. **T. erécta** H. & A. Fig. 442. Plants diffusely branched and tufted, becoming reddish with

442. Tillaea erecta H. & A.; *a*, habit x 1; *b*, branchlet x 5.

age, floriferous nearly to the base, 1 to 3 in. high; leaves ovate or oblong, connate, 1 to 1½ lines long; sepals ½ line long, equaling or somewhat exceeding the narrowly lanceolate petals; carpels usually 1 (occasionally 2)-seeded. —Common in dry commonly sandy ground, 20 to 2000 ft., throughout cismontane Cal.; n. to Ore., s. to L. Cal.; Chile. (T. minima Miers.) Var. ERÉMICA Jepson n. var. Plants very slender; pedicels as much as 1½ lines long.—Vallecito, w. Colorado Desert (Jepson 8636, type).

2. **SEDÉLLA** Britt. & Rose

Diminutive annuals. Leaves small, ovate to oblong-ovate, very fleshy, resembling rice-grains. Flowers in cymes. Calyx 5-toothed, the teeth triangular. Petals 5, linear to ovate-lanceolate, united at base. Stamens 10. Carpels erect. (Diminutive of Sedum.)

1. **S. pùmila** (Benth.) Britt. & Rose. Stems slender, 1 to 4 in. high, with a few opposite or subopposite ascending branches of about equal length and hence the plant flat-topped; leaves few, 2 to 2½ lines long; cyme with 2 or 3 racemose branches; petals yellow, 1 to 1½ lines long, spreading in anthesis but later becoming erect; sepals minute.—Foothills, 300 to 3000 ft.: Sierra Nevada from Tulare Co. to Butte Co.; Napa Range. Var. CONGDÒNII Jepson n. comb. Sepals toothed; petals averaging a little smaller, reddish outside; suture of carpels with a fringe of glands.—Mariposa and Tulare Cos. (S. congdoni Britt. & Rose.)

3. **CONGDÒNIA** Jepson n. gen.

Diminutive herb with very slender tuber-bearing rootstock. Stem scapoid, naked or with 1 or 2 inconspicuous leaves on the upper fourth, bearing a single terminal erect flower. Leaves ovate, relatively thin, closely imbricated in basal rosettes. Petals white, ovate, united for about ⅛ their length into a tube. Carpels erect, several-seeded. Seeds rubescent. (J. W. Congdon of Mariposa Co., acute-minded collector of the Sierran flora.)

1. **C. pinetòrum** (Bdg.) Jepson n. comb. Stems very slender, ½ to 1½ in. high; leaves sessile, 1 to 1½ lines long; petals 1½ to 2 lines long.—East slope of the Sierra Nevada near Mammoth, Mono Co. (Sedum pinetorum Bdg.)

4. **HASSEÀNTHUS** Rose

Stems one to several from globose or oblong corms. Leaves not in rosettes; basal leaves linear; stem leaves narrowly ovate, flattish. Flowers yellow or white, in a cyme, the 2 or 3 branches secund, widely spreading. Petals united at base into a short tube. Carpels widely spreading. (Dr. H. E. Hasse, local collector in the Santa Monica Mts., and Greek anthos, flower.)

1. **H. variegàtus** (Wats.) Rose. Stems 1 to 6 in number, 4 to 9 in. high; corms 1 to 3; lower leaves linear, turgid, a trifle flattened, green, 1 to 2½ in. long, 1½ to 2½ lines wide; stem leaves 2 to 3 lines long; petals bright yellow.—Clay depressions or rocky soil, lower foothills or mesas, seaward S. Cal., 100 to 2000 ft. (Sedum variegatum Wats.) Var. BLOCHMÀNAE Jepson n. comb. Petals white with a purplish-brown midvein.—Near the sea, San Luis Obispo Co. to San Diego Co. (S. blochmanae Eastw.)

5. **RHODÌOLA** L.

Perennial herbs. Stems several from a short scaly caudex crowning a stout root. Leaves flat, comparatively thin, distributed equally up the stem, not in rosettes. Flowers dioecious or polygamous, borne in a very dense cyme, the branches not secund. Sepals and petals usually 4 and stamens 8. Petals in ours dark purple, spreading a little. Carpels erect, dark purple. (From Greek rhodon, a rose, referring to the rose-scented roots.)

1. **R. ròsea** L. var. **integrifòlia** Jepson n. comb. WESTERN ROSEROOT. Stems erect, 3 to 6 in. high; leaves ovate to oblong-ovate, entire or obscurely den-

tate, sessile by a broad base, 5 to 12 lines long, 2½ to 4 lines wide, green; flowers 1½ to 2½ lines long.—Alpine, 9500 to 12,500 ft., Sierra Nevada from Tulare Co. to Eldorado Co.; n. to Alas., e. to Rocky Mts. (Rhodiola integrifolia Raf.)

6. **SÈDUM** L. Stone-crop

Ours perennial herbs. Flowers usually yellow but often white or reddish-tinged, disposed in a cyme composed of about 2 or 3 racemose secund branches. Petals 5, distinct or a little united at the base. Stamens 10. Carpels distinct or nearly so, several-seeded. (Latin sedeo, to sit, on account of the lowly habit.)

Carpels widely divergent, their outer and finally lower edges almost horizontal or at right angles with the pedicel; leaves becoming scarious upon drying; rootstocks horizontal, usually branched, giving rise to two kinds of erect or ascending shoots: (a) flowering stems (leafy below), and (b) short densely leafy branches which are deciduous and propagating.
Leaves oblong to oblong-ovate, 3 to 6 lines long, broadest a little below the middle; Coast Ranges and s. Sierra Nevada.....1. *S. radiatum.*
Leaves linear-lanceolate, 5 to 11 lines long, broadest at the base; Lassen and Modoc Cos. .....2. *S. douglasii.*
Carpels erect or suberect; leaves not becoming scarious upon drying; plants commonly spreading by well developed horizontal rootstocks; rootstocks branching, the branches ending in dense leaf rosettes and so forming mat-like plants.
Leaves terete, green; leaf rosettes ovate.....3. *S. stenopetalum.*
Leaves spatulate, often glaucous; leaf rosettes close, flat.
Petals distinct or nearly so, yellow or white; cyme mostly flat-topped.....
4. *S. spathulifolium.*
Petals united for ⅛ to ¼ their length, yellow and usually white-margined, or white; cyme mostly elongated or thyrsoid.....5. *S. obtusatum.*

1. **S. radiàtum** Wats. Stems 3 to 7 in. high; leaves thin, flattened, oblong to oblong-ovate, 3 to 6 lines long and 1 to 1½ lines wide, a little wider than the broad sub-clasping base, white-membranous and nerved on drying; petals bright yellow, widely spreading, 3 to 4 lines long.—Rocky situations, 1500 to 4500 ft.: Coast Ranges from Humboldt Co. to Monterey Co.; s. Sierra Nevada (Tulare Co.). Differing from S. douglasii in its range and in the size and shape of its leaves, but manifestly a very close relative of it.

2. **S. douglàsii** Hook. Stems 3 to 8 in. high; leaves linear-lanceolate, more or less flattened, 5 to 11 lines long, 1½ lines wide, the much dilated base scarious-sheathing; petals as in no. 1.—Rocky places, Lassen and Modoc Cos.; n. to Canada.

3. **S. stenopétalum** Pursh. Stems erect, 3 to 6 in. high, simple; leaves terete, green, 2 to 4 lines long, in close ovate clusters; cymes rather close, sparsely branched; petals bright yellow, or at times with a dark midvein, spreading, 3 to 4 lines long.—Mts. of Modoc and Siskiyou Cos., 7000 to 10,000 ft.; n. to Alb., e. to Rocky Mts.

4. **S. spathulifòlium** Hook. Stems erect, 4 to 8 in. high, simple; leaves broadly spatulate, glaucous or occasionally green, 5 to 10 lines long, 2½ to 3½ lines wide, the apex rounded, with a small acumination; stem leaves smaller and oblongish; cyme dichotomously branched, 1 to 2 in. wide, somewhat less high; petals widely spreading, yellow or white, 3 to 4 lines long.—Usually gregarious on shaded moss-covered rocks in the foothills, 200 to 5000 ft., throughout cismontane Cal.; n. to B. C. It is our most common species of Crassulaceae.

5. **S. obtusàtum** Gray. Stems erect, leafy, 3 to 6 in. high; leaves broadly spatulate, thick, green, 5 to 12 lines long, 2 to 3 lines wide; stem leaves linear-spatulate to oblong; cyme elongate or thyrsoid, sometimes flat-topped; petals oblong-lanceolate, the upper portion spreading or recurving, united for ⅛ to ¼ of their length into a distinct tube, brownish yellow (and usually with a well defined white margin) or white, 3 to 5 lines long.—Growing over rocks in the mts., 4500 to 12,000 ft.: Sierra Nevada from Tulare Co. to Nevada Co.; Coast Ranges from Mendocino Co. to Siskiyou Co. Very close to S. oreganum Nutt. of Oregon and perhaps not specifically distinct.

7. COTYLÈDON L. Live-for-ever

Perennial herbs. Flowering stems with reduced or scale-like leaves, arising from the leaf axils of a conspicuous basal rosette. Leaves of the rosette thick and fleshy. Flowers disposed in cymes, their secund branches racemose or thyrsoid. Petals white, yellow, orange or reddish, united at base or below the middle, erect or with the tips a little spreading. Stamens 10, borne on the tube. Carpels many-seeded. (Greek kotule, a shallow cup, referring to the rosettes.)

Carpels erect, usually distinct.
- Rosettes very large (6 to 8 in. wide), raised on a stout caudex 2 to 6 in. high; plant densely white-mealy; leaves 2 to 2½ in. wide; seaward belt, S. Cal. ..... 1. *C. pulverulenta.*
- Rosettes medium-sized (½ to 3 in. wide), white-glaucous to green, borne at the ground on a very short caudex; leaves ¼ to 1½ in. wide.
  - Pedicels stout, shorter than the flowers; flowers yellow.
    - Rosettes globose, very compact; leaves very thick; sea bluffs or headlands.. 2. *C. farinosa.*
    - Rosettes somewhat flat-topped, less dense; leaves less thick; seaward belt, San Francisco to San Luis Obispo ..... 3. *C. caespitosa.*
  - Pedicels slender, equaling or exceeding the flowers.
    - Flowers yellow or orange, sometimes turning reddish in age; cismontane Cal. 4. *C. laxa.*
    - Flowers reddish from the first; S. Cal. back of seaward belt. 5. *C. lanceolata.*

Carpels widely spreading, slightly united at base.
- Leaves lanceolate, distinctly flattened; inflorescence cymose or thyrsoid.. 6. *C. viscida.*

Leaves linear, terete or subterete, flattened strongly only near the base.
- Inflorescence mostly open, commonly a thyrsoid cyme ..... 7. *C. edule.*
- Inflorescence a round-topped cyme, densely flowered ..... 8. *C. densiflora.*

1. **C. pulverulénta** (Nutt.) Baker. Chalk Lettuce. Plants stout, 2½ to 4 ft. high, covered with a dense white mealy powder; flowering stems very stout, densely leafy; basal rosettes rather loose and flattish, their leaves broadly spatulate, usually acuminate, spreading, 3 to 6 in. long, 2 to 2½ in. wide; stem leaves ovate or suborbicular, sessile or clasping, 1 to 1½ in. wide; branches of the cyme 2 or 3, mostly simple, widely spreading, 6 to 9 in. long; flowers red, narrow; pedicels 1 to 3 lines long.—Dry rocky slopes, 20 to 2000 ft., sea-bluffs or mostly near the sea: Los Angeles Co. to San Diego Co.; s. to L. Cal. Due to their large size and chalky-white color, the plants of this species are striking features of the rocky hillsides of the seaward belt of S. Cal.

443. Cotyledon farinosa Baker; *a*, habit x ⅓; *b*, fl. x 1; *c*, gland x 6.

2. **C. farinòsa** Baker. Bluff Lettuce. Fig. 443. Plants glabrous, glaucous, 5 to 12 in. (or to 2⅓ ft.) high; rosettes dense, subglobose; leaves linear or oblong, rather thick for their width, 1 to 2 in. long, ½ to ¼ as wide, usually widest at the base; stem leaves numerous, broad, somewhat clasping, 5 to 6 lines wide; flowers cream-white, on very short stout pedicels; cyme usually compact.—Bluffs along the ocean: Monterey Co. to Del Norte Co. (Sedum cotyledon Jacq.)

3. **C. caespitòsa** Haw. Fig. 444. Plants green or somewhat glaucous, ⅓ to 1¾ ft. high; rosettes usually rather loose; leaves 2 to 3 (even 6) in. long, 6 to 11 lines wide, above the middle a trifle wider than at the base, not so conspicuously thick as in no. 2; flowers yellow or pale, on stout pedicels; cyme with close or elongated branches.—Rocky ground near

the coast from San Luis Obispo Co. to San Francisco.

4. **C. láxa** (Lindl.) Brew. & Wats. ROCK LETTUCE. Plants 7 to 12 in. high, green or glaucous; rosettes loose; leaves oblong to lanceolate, evidently wider above than at base, 1 to 3 in. long, ½ to 1 in. wide, relatively thinnish; flowers clear yellow or orange but frequently turning reddish on drying; pedicels slender, some of them equaling or exceeding the flowers; cyme dichotomous, rather loose.—Rocky ground, 300 to 5500 ft.: back of the coast in middle Cal. and eastward to the Sierra Nevada. The only species over the interior and montane portion of middle Cal. Var. PANICULÀTA Jepson n. comb. Cyme paniculate (the main axis with a terminal and several lateral peduncled cymes).—Mt. Hamilton Range. (C. caespitosa var. paniculata Jepson.) Var. SETCHÉLLII Jepson. Stem branched from above the middle, the branches racemose, elongated.—Mt. Hamilton foothills. Var. CYMÒSA Jepson n. comb. Plants 10 to 14 in. high; leaves oblong-lanceolate, 4 to 4½ in. long.—Napa Valley. (C. cymosa Baker.) Var. NEVADÉNSIS Jepson n. comb. Plants small, 3 to 4½ (or to 10) in. high, with small cymes; leaves often very broad.—Montane, 2250 to 8500 ft.: San Bernardino and San Gabriel mountains; Mt. Diablo; Sierra Nevada. (C. nevadensis Wats. Dudleya pumila and minor Rose.)

444. Cotyledon caespitosa Haw.; *a*, base of plant x ⅓; *b*, fl. stem x ⅓; *c*, fl. x 1; *d*, gland x 6.

5. **C. lanceolàta** (Nutt.) Brew. & Wats. DESERT SAVIOR. Plants 8 to 15 in. high, commonly glaucous; rosettes not dense; leaves spreading or ascending, narrowly lanceolate, scarcely widened above, 2 to 4 in. long, 2 to 8 lines wide, some outer ones often oblong; flowers reddish, usually drying very dark; branches of the cyme commonly few, 2½ to 4 in. long, the flowers discrete, sometimes rather few relatively; pedicels 4 to 6 lines long.—Rocky ground, 1000 to 4000 ft.: Santa Barbara Co. to San Diego Co.; s. to L. Cal. Var. SAXÒSA Jepson n. comb. Plants 5 to 6 in. high; calyx brick red.—Panamint Mts. (C. saxosa Jones.)

6. **C. víscida** Wats. Stems 10 to 17 in. high; leaves of the rosette lanceolate, flat, attenuate upwards from a very broad (6 to 8 lines wide) sessile base, 2 to 3 in. long, glabrous but very viscid; cyme flat topped or elongated and thyrsoid; petals yellowish and usually somewhat reddish.—Rocks near the sea: San Juan Capistrano Hot Sprs.; Oceanside. Var. INSULÀRIS Jepson n. comb. Plants not viscid, usually glaucous.—Dry cliffs, Santa Barbara Isls. (Stylophyllum insulare Rose.)

7. **C. èdulis** (Nutt.) Brew. Plants 1 to 1½ ft. high; leaves linear-attenuate, subterete, glaucous, dilated and flattened at base, 2 to 3 in. long; stem leaves small; cyme paniculate, 2 to 9 in. long, or reduced to 1 or 2 spreading branches; petals yellowish.—Dry cliffs, San Diego Co. Var. ATTENUÀTA Jepson n. comb. Slender, less robust.—Sw. San Diego Co. (Initial Monument); s. to L. Cal. (C. attenuata Wats.)

8. **C. densiflòra** (Rose) Fedde. Plants 6 to 9 in. high, very white-glaucous; cyme compound, rounded, densely flowered, 2½ to 4 in. wide; petals white or pinkish.—San Gabriel Mts., 900 to 2000 ft.: Fish Cañon (F. W. Peirson). (Stylophyllum densiflorum Rose.)

SAXIFRAGÀCEAE. Saxifrage Family

Perennial herbs or shrubs. Flowers perfect, perigynous, usually white, often red, never blue, borne in racemes, panicles or cymes, or solitary. Calyx 5-lobed or -cleft. Petals commonly 5, sometimes 4 to 8. Stamens 5 or 10, sometimes 3, or 8 to 20, or numerous. Ovary partly or wholly inferior, or superior, 1 to 5-celled, the styles or stigmas as many as the cells or placentae, the latter either parietal or axile. Fruit a capsule, follicle, or berry. Seed with endosperm.

A. Fruit a capsule; ovary superior or partly inferior.

Styles 2 (3 in no. 7), distinct; leaves alternate or mostly basal (in no. 12 opposite, in ours), without stipules (but see nos. 4 and 7); herbs.—Tribe Saxifrageae.
- Sterile filaments none.
  - Ovary 2-celled and placentae axile, or carpels 2 and distinct.
    - Stamens 10; ovary slightly inferior or free.
      - Leaves ovate, oblong or lanceolate to linear.
        - Petals ovate to roundish; flowers appearing with or after the leaves; stems from rootstocks or fibrous roots ..... 1. Saxifraga.
        - Petals spatulate; flowers appearing before the leaves; stems from a corm-like root ..... 2. Jepsonia.
      - Leaves peltate, 1 to 2 ft. broad ..... 3. Peltiphyllum.
    - Stamens 5.
      - Petals deciduous; ovary ½ to ¾ adherent to the calyx ... 4. Boykinia.
      - Petals persistent; ovary superior ..... 5. Bolandra.
  - Ovary 1-celled with 2 parietal placentae alternate with the styles or stigmas.
    - Petals 5.
      - Stamens 10.
        - Petals entire, almost filiform; capsule early and unequally 2-valved to the base ..... 6. Tiarella.
        - Petals usually laciniate or toothed; capsule equally 2-valved.
          - Petals white or pink, clawed; styles 3; rootstocks slender, tuberous ..... 7. Lithophragma.
          - Petals red, sessile; styles 2; rootstock stout, not tuberous .... 8. Tellima.
      - Stamens less than 10.
        - Petals cleft or pinnatifid; stamens 5 (in ours) ..... 9. Mitella.
        - Petals entire.
          - Calyx campanulate or turbinate; stamens 5; capsule 2-beaked with the styles but not lobed ..... 10. Heuchera.
          - Calyx tubular; stamens 3; capsule deeply 2-lobed, the beaks strongly diverging ..... 11. Tolmiea.
    - Petals none; stamens 8 ..... 12. Chrysosplenium.
- Sterile filaments present; ovary 1-celled with 3 or 4 parietal placentae opposite as many stigmas; fertile stamens 5 ..... 13. Parnassia.

Styles 3 to 5, distinct, or more or less united into one; fruit a capsule; leaves opposite, without stipules; shrubs.—Tribe Hydrangeae.
- Stamens 20 to numerous; seeds numerous; styles persistent.
  - Styles 3 to 5, distinct at least at apex; ovary inferior, completely 3 to 5-celled; capsule obconic or obovoid ..... 14. Philadelphus.
  - Style 1, short; ovary half-inferior, imperfectly 5 (2 to 8)-celled; capsule conic or ovoid ..... 15. Carpenteria.
- Stamens less than 20; styles 3 to 5.
  - Styles persistent; stamens 10; calyx-lobes pubescent; flowers (in ours) pink, in cymes ..... 16. Jamesia.
  - Styles deciduous; stamens 8 to 12; calyx-lobes glabrous; flowers white, in racemes. 17. Whippleа.

B. Fruit a berry; ovary wholly inferior.

Leaves alternate, with stipules; styles 2, or more or less united into one; shrubs.—Tribe Ribesieae ..... 18. Ribes.

1. SAXÍFRAGA L. Saxifrage

Herbs, the leaves entirely or mainly in a basal cluster. Flowers white, in panicles or close clusters. Calyx cohering with the base of the ovary or almost free, 5-cleft or -parted. Petals entire, commonly deciduous. Stamens 10. Styles 2. Capsule 2-beaked, 2-celled, opening down or between the beaks, or sometimes the fruit consists of 2 nearly separate follicles. Seeds numerous. (Latin saxum, a rock, and frango, to break.)

Stems with the leaves all basal or nearly so.
- Perennials.
  - Caudex not bulbous.
    - Petals deciduous; stems scape-like, naked.
      - Leaves rounded or cordate, petioles longer than the blade ... 1. *S. aestivalis*

Leaves not rounded or cordate.
Petioles distinctly shorter than the blades.
Flowers in a terminal cluster; plants 2 to 5 in. high... 2. *S. nivalis.*
Flowers in an elongated panicle; plants 1 to 3 ft. high... 3. *S. integrifolia.*
Petioles broad, mostly as long as, or longer than the blades.
Petals not spotted; filaments not petaloid ..... 4. *S. virginiensis.*
Petals with 2 yellow-green spots near the base; filaments petaloid.. 5. *S. marshallii.*
Petals persistent; stems with 1 to 3 small remote leaves above the basal ones; basal leaves cuneate..6. *S. fragarioides.*
Caudex scaly, bearing bulblets; stems scape-like.
Leaves rounded, lobed, the petioles several times longer than the blades; sepals reflexed. 7. *S. mertensiana.*
Leaves obovate, entire or merely denticulate; sepals not reflexed.....8. *S. nidifica.*
Delicate annual; scape simple or often paniculate; plants 2 to 8 in. high.. 9. *S. bryophora.*
Stems leafy; caespitose alpine plants..... 10. *S. tolmiei.*

445. Saxifraga aestivalis Fisch.; *a*, base of plant x ½; *b*, fl. stem x ½; *c*, fl. x 3; *d*, stamen x 6.

1. **S. aestivàlis** Fisch. Fig. 445. Scape 9 to 18 inches high, this and the leaves from a short creeping rootstock; herbage glabrous or somewhat pubescent; leaves reniform to round-cordate, almost equally dentate, ¾ to 2½ in. broad; panicle open, narrow; carpels purple.—Along brooks, 7000 to 9600 ft.: San Bernardino Mts.; Sierra Nevada from Tulare Co. to Lassen Peak; Yollo Bolly Mts. to Trinity Mts.; n. to Alas.

446. Saxifraga integrifolia Hook.; *a*, base of plant x ½; *b*, infl. x ½; *c*, fl. x 2; *d*, capsule x 2.

2. **S. nivàlis** L. Plants mostly purplish, 2 to 5 in. high; leaves oblong-ovate or spatulate-obovate, 3 to 9 lines long, coarsely dentate to entire; flowers small, capitate; petals oblong or spatulate, little exceeding the erect calyx-lobes; stamens filiform; styles very short.—High montane, 10,000 to 11,200 ft., Sierra Nevada, from Fresno Co. to Nevada Co.; n. to the arctic. July-Oct.

3. **S. integrifòlia** Hook. Fig. 446. Scapes stoutish, 12 to 22 in. high; herbage roughly glandular-pubescent to almost glabrous; leaves obovate to lanceolate-spatulate, 2 to 7 in. long, mostly narrowed at base to a short margined petiole; flowers in small thick clusters in a narrow thyrse-like

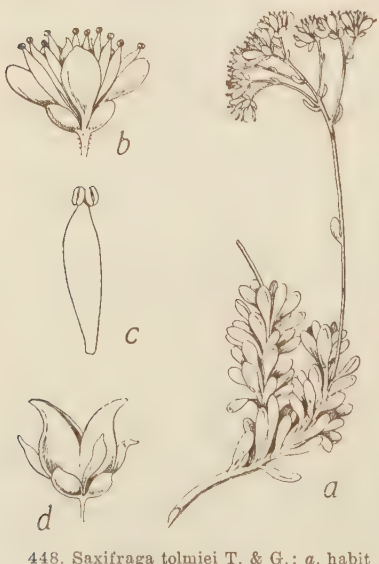
panicle.—Swamps or marshy meadows, 3500 to 7400 ft., Sierra Nevada from Tulare Co. to Siskiyou Co. June-Aug. Var. SIÉRRAE Cov. Leaves without petiole-like base.—Mts. of Tulare Co.

4. **S. vírginiénsis** Michx. var. **califórnica** Jepson. Scape 6 to 11 in. high; herbage pubescent with scattered hairs, the hairs often gland-tipped; leaves ovate to elliptic, rather serrate, somewhat undulate, ½ to 2 in. long; panicle open; lobes of the calyx ovate, becoming reflexed; filaments not dilated; carpels almost distinct.—Shaded rocky places in the hills, 500 to 6000 ft.; Coast Ranges and Sierra Nevada, s. to the San Bernardino and Santa Monica mountains. Mar.-June. Var. NAPÉNSIS Jepson n. comb. Petals none.—Napa Range. (S. napensis Small.)

5. **S. marshállii** Greene. Plants 4 to 12 in. high; scape and leaves from a short caudex; leaves oblong or ovate, rather coarsely dentate, ½ to 1½ in. long.—Montane, 5000 to 7000 ft., Humboldt and Siskiyou Cos. May-June.

6. **S. fragàrioides** Greene. Stems 4 to 8 in. high, arising from a short stout caudex; caudex simple or branched, crowning the stout root; herbage glandular-pubescent; leaves cuneate, dentate at apex (or above the middle), the sides entire, ½ to 1½ in. long; petioles disjointing roughly from the blade in age, persistent on the caudex; cymes disposed in a narrow panicle; calyx lobes finally reflexed; petals 1 line long, clawed, becoming reflexed; ovary about half-inferior.—Montane, 5500 to 6500 ft., nw. Cal. (Trinity Mts.; Salmon Mts.; Marble Mt.); n. to southern Ore.

447. Saxifraga bryophora Gray; *a*, habit x ¾; *b*, bulblet x 3; *c*, long. sect. of fl. x 3; *d*, stamen x 6.



448. Saxifraga tolmiei T. & G.; *a*, habit x ½; *b*, fl. x 2; *c*, stamen x 4; *d*, capsule x 2.

7. **S. merténsiàna** Bong. Plants 4 to 14 in. high; petioles and scapes glandular-hairy; leaves orbicular, cordate at base, crenately toothed, ¾ to 3¼ in. broad; petioles scarious-dilated at base, 1 to 6 in. long; panicle open, often bearing granule-like bulblets in the axils; flowers pendulous after anthesis (the slender pedicels recurved only at the very tip); calyx-tube very short, its lobes oblong, reflexed in fruit; filaments dilated toward the summit, white and petal-like; carpels half-united or a little more.—Woods near the coast, Marin Co. to Humboldt Co.; n. to Alas. Mar.-May.

8. **S. nidífica** Greene. Like no. 3 but the plants small, 5 to 12 in. high, the roots embedded in a mass of bulblets; leaves narrowed to a broad petiole, both together ½ to 2½ in. long.—Montane, 5000 to 8000 ft., Sierra Nevada and n. to Siskiyou Co. Rather rare. June.

9. **S. bryóphora** Gray. Fig. 447. Plants 2 to 8 in. high, the scape ending in a

raceme or very slender panicle; leaves linear-oblong, acute, 3 to 8 lines long; pedicels soon deflexed; flowers solitary and terminal, those along the axis or branches of the inflorescence replaced by leaf-buds or bulblets which fall to the ground and reproduce the species vegetatively; petals 2-spotted toward the base.—High montane, in moist gravelly soil, 8000 to 11,200 ft., Sierra Nevada from Tulare Co. to Tuolumne Co. and Mt. Shasta. July-Sept.

10. **S. tólmiei** T. & G. ALPINE SAXIFRAGE. Fig. 448. Plants 2 to 5 in. high, the stems leafy, diffusely branching, forming dense tufts; leaves linear, closely imbricated on the short branches, sessile, 3 to 5 lines long; cymes disposed in a corymbose panicle or close cluster; filaments dilated at the summit.—High montane, 9000 to 10,000 ft., Sierra Nevada from Tulare Co. to Mariposa Co., Lassen Peak and Mt. Shasta; n. to B. C. July.

2. **JEPSÒNIA** J. K. Small

Perennial herbs with basal leaves and scapes from corm-like roots. Flowers few in a cyme terminating a naked scape, appearing in the autumn before the leaves. Leaves round-cordate, crenate and shallowly crenate-lobed. Calyx 5-toothed, its tube short-cylindric, the base with a honey-bearing area within. Petals inserted by short claws nearly in the sinuses, rotately spreading. Stamens 10, those opposite the sepals dehiscing their pollen very early. Carpels free from the calyx, united, their styles bearing kidney-shaped stigmas. (Willis Linn Jepson, author of a Flora of California.)

1. **J. párryi** (Torr.) Small. Scapes 3 to 10 in. high; leaves when mature ¾ to 2 in. wide; flowers 2¼ lines long; calyx truncatish at base, with 10 purple nerves, the alternate ones forking at the sinuses, a branch proceeding to the apex of each adjacent lobe; petals ovatish, white, purple-nerved beneath, 2 lines long; ovary with fine brownish nerves.—Moist places in the dry hills, flowering in Nov. and Dec. after the fall rains begin.—San Diego to San Jacinto Valley; Santa Rosa and Santa Cruz Isls. Var. HETERÁNDRA Jepson n. comb. Fig. 449. Calyx acutish at base.—Sierra Nevada foothills from Mariposa Co. to Tuolumne Co. (J. heterandra Eastw.)

449. Jepsonia parryi var. heterandra Jepson; *a*, fl. stems and corm x ½; *b*, leaves x ½; *c*, long. sect. of fl. x 3; *d*, capsule x 2.

3. **PELTIPHÝLLUM** Engler

Coarse herb with thick fleshy horizontal rootstocks, the flowers appearing before the leaves. Leaves orbicular-peltate, cupped at center, all basal, the petioles stipular. Scapes naked, surpassing the leaves. Flowers white, in terminal, simple or paniculately compound cymes. Calyx-tube joined to lower part of the pistils, the lobes reflexed in age. Stamens 10. Pistils 2, almost distinct. Follicles almost, but not quite, distinct, turgid, spreading. (Greek pelti, peltate, and phullon, leaf.)

1. **P. peltàtum** (Torr.) Engler. Fig. 450. Stout plant 1 to 4 ft. high; leaves 1 to 2 ft. broad, 9 to 15-lobed, irregularly serrate, the petioles 1 to 3½ ft. high; flowers 6 to 7 lines broad.—Banks of rapid mountain streams, 1400 to

5600 ft., Sierra Nevada from Tulare Co. to Siskiyou Co., thence s. in the Coast Ranges to Humboldt Co.; n. to central Ore. June-July. The stout fleshy petioles, with the epidermis peeled off, were eaten by the native tribes and regarded as a delicacy. (Saxifraga peltata Torr.)

450. Peltiphyllum peltatum Engler: *a*, infl. x ⅔; *b*, fl. x 1⅔.

4. **BOYKÍNIA** Nutt.

Perennial herbs with creeping rootstocks. Stems simple, bearing a few alternate leaves and paniculate or corymbose cymes of white flowers. Calyx-tube turbinate or subglobose or ovate, ½ to ¾ adherent to the 2-celled ovary. Petals linear to elliptic, entire, with a short claw, deciduous. Stamens 5, short. Styles 2. Capsule 2-beaked. (Dr. Boykin of Georgia.)

Flowers secund; corolla slightly irregular; petals narrow, obtuse at apex; ovary half inferior.—Subgenus THEROFON.
- Petals cuneate-oblong, 1½ to 2 lines long, 2 to 3 times as long as the calyx-lobes; leaves with stipules.....1. *B. elata.*
- Petals linear-spatulate, 1 line long, little longer than the calyx-lobes; leaves without stipules.....2. *B. rotundifolia.*

Flowers in terminal corymbose cymes; corolla regular; petals broad; ovary almost wholly inferior.—Subgenus HEMIEVA.
- Rootstock or caudex stout, vertical, not bulblet-bearing; leaves incised; stipules foliaceous, conspicuous.....3. *B. major.*
- Rootstock very short, vertical, crowded with bulblets; leaves with 3 nearly distinct leaflets; stipules none.....4. *B. ranunculifolia.*

1. **B. elàta** (Nutt.) Greene. Fig. 451. Stem slender, erect, 1¼ to 2 ft. high; herbage a little hairy, the petioles and stems very rusty-hairy at base; leaves thin-membranous, shallowly lobed or incised, serrate, 1 to 4 in. broad; petioles long, dilated at base and bearing stipule-like bristles or subulate lobes; flowers slightly irregular, borne in a panicle of secund racemes; lower portion of calyx-tube glandular-hairy, upper portion nerved or somewhat ridged; calyx in age urn-shaped; calyx-lobes lanceolate-triangular.—Woods near the coast, Santa Lucia Mts. to Del Norte Co. (B. occidentalis T. & G.)

451. Boykinia elata Greene; *a*, habit x ½; *b*, long. sect. of fl. x 2½.

2. **B. rotundifòlia** Parry. Stems slender, 1 to 2 ft. high, stems and petioles glandular-hirsutulous; leaves round-cordate, very shallowly lobed, denticulate, 2 to 7 in. broad; petioles bristly at base, the bristles sometimes pinnately branched; calyx 10-nerved, hirsutulous, more or less glandular.—Montane, 2500 to 5000 ft.: San Gabriel Mts.; San Bernardino Mts.

3. **B. màjor** Gray. Fig. 452. Stem coarse and stout, 2 to 3 ft. high;

herbage somewhat glandular-scabrous; leaves roundish-cordate, 4 to 8 in. broad, 5 to 9-cleft, the divisions coarsely incised and toothed; lowest stipules membranous, the upper foliaceous, partly clasping the stem, often unequal in size and unlike in shape, 5 to 20 lines broad, those at the middle of the stem broadest; calyx-tube at first hemispherical, soon subglobose or urn-shaped, the lobes triangular, acute; petals obovate or roundish ovate, 2½ lines long.—Wet meadows in woods, 3000 to 5500 ft.; Sierra Nevada from Mariposa Co. to Butte Co.; Humboldt Co. to Siskiyou Co.; n. to southern Ore.

4. **B. ranúnculifòlia** (Hook.) Greene. Stem 3 to 8 in. high; leaves with 3 almost distinct leaflets; leaflets broader than long or somewhat fan-shaped, mostly 3-lobed at apex, often with 1 or 2 supplementary lobes or teeth, 3 to 8 lines broad; flowers 3 lines long, in a compact or open cyme.—Montane, 5000 to 6000 ft., Plumas Co. (Spanish Peak) to the Siskiyou Mts.; n. to B. C. (Saxifraga ranunculifolia Hook.)

452. Boykinia major Gray; *a*, leaf x ¼; *b*, fl. stem x ½; *c*, long. sect. of fl. x 2.

453. Bolandra californica Gray; *a*, habit x ½; *b*, long. sect. of fl. x 2½.

5. **BOLÁNDRA** Gray

Perennial herbs with bulblet-bearing rootstocks and leafy stems. Leaves thin, palmately-veined. Flowers loosely paniculate. Calyx cup-shaped. Petals greenish with purple border, narrowly lanceolate-attenuate. Pistils 2, lightly joined and free from the calyx. (Dr. H. N. Bolander, botanist of the California Geological Survey from 1865 to 1870.)

1. **B. califórnica** Gray. Fig. 453. Stems slender, 6 to 9 in. high, puberulent, the leaves glabrous; leaves round-cordate, ½ to 1¾ in. broad, 5-cleft, the segments rounded and shallowly lobed or toothed; petioles 2 to 4 in. long; upper cauline leaves reduced, ovate, toothed, sessile; flowers 3 lines long; calyx-lobes and petals recurving. — Montane, wet rocks, 5000 to 8400 ft., Mariposa Co. to Lake Tahoe.

6. **TIARÉLLA** L. False Mitre-wort

Perennial herbs with white flowers in a terminal raceme or panicle. Calyx adherent only to very base of

ovary, its lobes ovate. Petals linear-subulate with short claws, inconspicuous. Stamens 10, long and slender. Ovary 1-celled, compressed, 2-horned, the horns tapering into the long filiform styles. Capsule membranous, early dehiscent; valves unequal, one becoming elongated, the other remaining short. Seeds few at the base of each parietal placenta. (Diminutive of Greek tiara, a high cap, in allusion to the pistil.)

1. **T. unifòliàta** Hook. Stems several, sparingly leafy, ¾ to 2 ft. high; leaves roundish or ovate, 3 to 5-lobed, cordate at base, 1 to 4 in. broad, the lobes crenate; cauline leaves 2 or 3; basal leaves long-petioled (3 to 9 in.); panicle 3 to 9 in. long; calyx lobes minutely ciliolate.—Cañons and woods near the coast, 200 to 2000 ft., Santa Cruz Mts. to Humboldt Co.; n. to Mont. and Alas.

7. LITHOPHRÁGMA Nutt.

Perennial herbs, the rootstocks tuberous or with grain-like bulblets. Stems simple, bearing a simple terminal raceme of several white or pink flowers. Leaves chiefly basal, their petioles with stipule-like dilations at the base. Calyx-tube adherent to the base or lower half of the ovary. Petals inserted in the sinuses of the calyx, cleft or toothed or entire, usually a little unequal. Stamens 10, included. Ovary 1-celled, with 3 parietal placentae and 3 very short styles. Capsule conical. Seeds numerous. (Greek lithos, rock, and phragma, fence, referring to the habitat.)

Petals white, entire or toothed; basal leaves crenate or shallowly lobed.
  Calyx-tube turbinate; petals mostly 3-toothed at apex, the central tooth rather larger; ovary half free from the calyx ..... 1. *L. affinis.*
  Calyx-tube shortly campanulate, broad.
    Calyx-tube acutish at base; petals entire; ovary half-free from calyx ..... 2. *L. cymbalaria.*
    Calyx-tube rounded or truncate at base; petals toothed or entire; ovary almost wholly free from calyx ..... 3. *L. heterophylla.*
Petals pink or pinkish, palmately cleft into 3 equal lobes or sometimes 5 or 7-parted; basal leaves twice palmately divided.
  Calyx broadly campanulate, acute at base ..... 4. *L. tenella.*
  Calyx clavate ..... 5. *L. parviflora.*

1. **L. áffinis** Gray. Woodland Star. Stems 9 to 16 in. high, hispidulous, the hairs spreading and glandular; basal leaves often bronze-brown, roundish in outline and crenately lobed, varying into the cauline; cauline mostly parted into 3 broad divisions which are deeply incised or merely toothed; pedicels about equaling the turbinate calyx; raceme 7 to 10-flowered.—Open ground or open woods of the foothills, 150 to 2000 ft., common: Coast Ranges; Sierra Nevada. (Tellima affinis Bol.)

2. **L. cymbalària** T. & G. Stems filiform, 10 to 17 in. high; basal leaves round-reniform, 3 to 5-lobed, 2 to 9 lines broad; cauline leaves mostly only a pair, these opposite or nearly so; flowers few, the slender pedicels exceeding the calyx; calyx broad, often with an obscure brownish or constricted band below the lobes; petals entire or nearly so.—Coastal, South Coast Ranges from San Luis Obispo Co. to San Diego Co. (Tellima cymbalaria Walp.)

3. **L. héterophýlla** T. & G. Stems 1 to 2 ft. high; herbage hirsutulose or somewhat scabrous-pubescent, sometimes glandular at base; leaves roundish, crenately lobed, ½ to 1¼ in. broad, the cauline very variable but mostly 3-parted with the divisions incised or toothed; pedicels mostly shorter than the calyx, often very short; calyx campanulate, truncate or rounded at base; sparingly puberulent; petals with 1 or 2 stout teeth on each side.—Shady ground in the hills, 500 to 3000 ft.: Coast Ranges; s. Sierra Nevada (Tulare Co. to Kern Co.); San Gabriel Mts.; San Bernardino Mts. (Tellima heterophylla H. & A.) Var. bolánderi Jepson. Leaves mostly very shallowly lobed; petals entire or with a small tooth on each side.—Lower foothills: Coast Ranges; Sierra Nevada. Var. scabrélla Jepson n. comb. Herbage and calyx scaberulous-glandular; petals entire.—Montane, 2000 to 9500 ft.: Sierra Nevada. (Tellima scabrella Greene.)

4. **L. tenélla** Nutt. Stems slender, 4 to 13 in. high, roughish with short glandular hairs; leaves mostly reddish-purple beneath, roundish in outline, 3 to 5-lobed, the lobes again deeply lobed and toothed, often cuneiform; pedicels as long as calyx; calyx-tube with a ring-like swelling at middle, bearing within a circular yellow gland; calyx campanulate, its tube acutish at base; petals pinkish, 3 to 3½ lines long, palmately cleft into 3 equal lobes or the lateral lobes smaller.—Mountain slopes, 2000 to 3000 ft.: San Antonio Mts.; San Bernardino Mts.; Sierra Nevada from Kern Co. to Siskiyou Co., thence sw. to Humboldt Co.; n. to B. C., e. to Rocky Mts. and n. The petals are rotate, whereas in L. heterophylla they are usually a little ascending. (Tellima tenella Walp.)

5. **L. parviflòra** (Pursh) Nutt. Similar to no. 4; calyx clavate, 3½ lines long, its tube rusty glandular-pubescent, somewhat annular-dilated at the middle; petals pink, 3-lobed, 4½ lines long.—Little Chico Creek, Butte Co.; n. to B. C., e. to Col. Very rare in Cal. (Tellima parviflora Hook.)

8. TÈLLIMA R. Br.

Perennial herbs with horizontal rootstocks. Stems simple, with a long terminal raceme of many flowers. Calyx inflated-campanulate, 10-nerved. Petals whitish, changing to red, sessile by a broad base, laciniate-pinnatifid, reflexed. Stamens 10. Ovary almost completely inferior, with 2 parietal placentae alternate with 2 styles. Capsule conical. (Name an anagram of Mitella.)

1. **T. grandiflòra** (Pursh) Dougl. FRINGE-CUPS. Stems 1½ to 3½ ft. high, hirsute with spreading hairs, as also the petioles; leaves roundish in outline, cordate at base, shallowly 3 to 5-lobed, serrate or crenate, 2 to 4 in. broad, the basal on petioles 2 to 9 in. long; flowers 3 to 4 lines long.—Woods, in or near the Redwood belt, Santa Cruz Mts. to w. Siskiyou Co.; n. to Alas. Apr.-May.

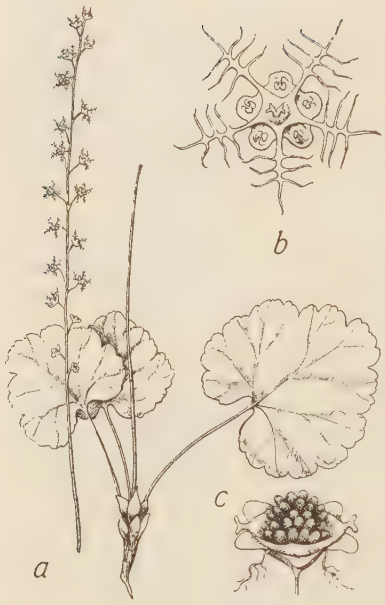
9. MITÉLLA L.

Perennial herbs with rootstocks. Leaves all basal, the slender scape-like stems ending in a spike-like raceme of small flowers. Calyx-tube about half-coherent with the ovary. Petals cleft. Stamens (in ours) 5, the filaments very short. Styles 2, short. Capsule opening before the seeds are ripe, the valves short and broad, forming a narrow rim to the pod. (Diminutive of the Latin mitra, a cap, in allusion to the pod.)

Petals whitish, palmately 3-cleft at apex; calyx broadly turbinate, its lobes triangular-lanceolate with acute sinuses, erect or little spreading; stamens erect; anthers ovate; styles simple; raceme 1-sided.
  Leaves obscurely lobed, crenate ..... 1. *M. trifida.*
  Leaves commonly 3-lobed above, not crenate ..... 2. ***M. diversifolia.***
Petals greenish, pinnately cleft into capillary divisions; calyx dish-shaped or saucer-shaped, its lobes short and broad with obtuse sinuses, spreading (the limb, therefore, merely undulate); stamens inflexed; anthers reniform; styles 2-lobed; raceme not 1-sided.
  Stamens opposite the sepals (as in the two preceding).
    Leaf-blades mainly glabrous ..... 3. *M. breweri.*
    Leaf-blades with scattered white hairs ..... 4. *M. ovalis.*
  Stamens opposite the petals ..... 5. *M. pentandra.*

1. **M. trifida** Graham. Plants 8 to 17 in. high; scapes and petioles retrorsely more or less hispid; leaves round-cordate, crenate, obscurely lobed, short-hispid with scattered hairs or glabrous, ¾ to 2 in. broad; calyx-lobes whitish; petals linear, 3-cleft at apex.—Montane, 6000 ft., Haypress Mdw., Siskiyou Co.; n. to Saskat.

2. **M. divérsifòlia** Greene. Plants 10 to 16 in. high; pubescence as in no. 1; leaves round-ovate in outline, cordate at base, most of them angularly 3-lobed above, the margin otherwise subentire, 1 to 2 in. long; calyx-lobes whitish; petals linear-cuneate, 3-cleft at apex.—Montane, 6000 ft.: Trinity Summit; w. Siskiyou Co.; n. to Wash.



454. Mitella breweri Gray; *a*, habit x ½; *b*, fl. x 3½; *c*, open capsule x 3½.

3. **M. brèweri** Gray. Fig. 454. Plants 6 to 12 in. high; petioles and scapes with scattered rusty hairs; leaves round-cordate, shallowly lobed and crenate, 1½ to 3 in. broad, glabrous on the upper surface, nearly so below; pedicels 1 to 3 lines long; petals pinnately divided into 5 to 7 rather remote capillary divisions; capsule 1 line broad.—Montane, 7000 to 11,000 ft., Sierra Nevada from Tulare Co. to Sierra Co.; n. to B. C.

4. **M. ovàlis** Greene. Plants 6 to 14 in. high; scapes and petioles rather densely pilose with downwardly turned hairs; leaves round-ovate with cordate base, hirsute with scattered but rather conspicuous white or brown hairs, ¾ to 1¾ in. wide; pedicels 1 line long; petals pinnately divided into 3 capillary divisions (sometimes one lateral division wanting, often two wanting and the petals thus linear-subulate), or sometimes into 5 divisions (acc. to Greene).—Low ground, river bottoms or wet banks, Humboldt coast. It propagates by stolons and forms a carpet in moist places.

5. **M. pentándra** Graham. Similar to M. breweri; petioles hairy, scapes glabrous; leaf-blades hispidulose with scattered hairs or glabrous; calyx-tube purple within; petals smaller, pinnately divided into about 5 to 7 capillary divisions; capsule 2 lines broad.—High montane, 6000 ft., Haypress Mdw., w. Siskiyou Co.; n. to Saskat., e. to Col.

10. HEÙCHERA L. Alum Root

Perennial herbs with stout rootstocks. Leaves mostly basal, rounded and shallowly lobed. Flowering stems scape-like, bearing a panicle of small flowers in cymose clusters. Calyx-tube adnate to the lower ½ of the ovary. Petals white, very small, clawed, entire, inserted on the throat of the calyx, or sometimes none. Stamens 5, ours with slender filaments. Capsule 1-celled, with 2 parietal placentae, dehiscent between the 2 beaks. (J. H. Heucher, 1677-1747, German professor of medicine.)

Inflorescence spike-like; stamens shorter than the calyx-lobes.
Calyx 1 to 1½ lines long; petals present; se. Cal.....1. *H. novomexicana.*
Calyx 2 to 3 lines long; petals none; ne. Cal.....2. *H. cylindrica.*
Inflorescence paniculate; stamens equal to or exceeding the calyx-lobes.
Petioles 1 to 8 in. long; leaf-blades 1 to 4 in. long.

455. Heuchera novomexicana Wheelock; *a*, habit x ½; *b*, long. sect. of fl. x 5.

Calyx turbinate, greenish, ½ to 1½ lines long; puberulent . . 3. *H. micrantha.*
Calyx hemispheric, reddish, 1 to 2 lines long, densely hairy. 4. *H. pilosissima.*
Petioles ½ to 3 in. long; leaf-blades ½ to 1½ in. long; calyx reddish or purplish, the lobes greenish-tipped . . . . . 5. *H. rubescens.*

1. **H. novomexicàna** Wheelock. Fig. 455. Plants 6 to 12 in. high, glandular-puberulent; scapes slender; leaves 4 to 8 lines broad, roundish-cordate, the lobes roundish, ciliate; petioles ½ to 2 in. long; calyx turbinate to campanulate, yellowish; petals white, inconspicuous.—White Mts.; e. to N. Mex.

2. **H. cylíndrica** Dougl. Plants 6 to 10 in. high, hirsutulose; scapes stoutish; leaves reniform or slightly cordate, 6 to 10 lines broad, hispidulous, the rounded lobes mucronate; petioles hirsute; calyx greenish, campanulate, puberulent; petals none.—Montane, 9000 ft., Modoc Co. n. to B. C. Var. GLABÉLLA Wheelock. Scapes and petioles puberulent or subglabrous; leaves 3 to 6 lines broad, truncate, glabrous, except the ciliate margins; spikes denser; calyx less hairy, yellowish.—Modoc Co.; n. to B. C. (H. glabella T. & G.)

456. Heuchera micrantha Dougl.; *a*, habit x ¼; *b*, fl. x 4.

3. **H. micrántha** Dougl. Fig. 456. Plants 1 to 3 ft. high; petioles and stems pilose-hirsute, the leaves hirsutulous and the inflorescence glandular-puberulent; leaves round- or ovate-cordate, 2 to 4 in. long, obtusely lobed and crenately toothed; flowers in an ample loose panicle; calyx shorter than the slender pedicels; petals narrowly oblong, curving, rather shorter than the calyx.—Near the coast, 100 to 1500 ft., Monterey Co. to Humboldt Co.; Sierra Nevada, 2200 to 7000 ft., from Tulare Co. to Butte Co. and n. to Siskiyou Co.; n. to Wash.

4. **H. pilosíssima** F. & M. Plants 1 to 2 ft. high; herbage very glandular-villous; flowers in close clusters, the panicle less ample than in no. 3; calyx globular, exceeding or almost equaling the pedicel.—Near the coast, Monterey Co. to Humboldt Co.

5. **H. rubéscens** Torr. Plants 5 to 12 in. high, the scapes sparingly hirsutulose or nearly glabrous; leaves ½ to 1½ in. broad, round-cordate, shallowly lobed, the lobes crenate with subacute teeth, the teeth ciliate, bristle-tipped; panicle open or narrow; calyx 2 to 3 lines long, its tube turbinate-cylindric, becoming urnshaped in age; petals linear to narrow-oblanceolate; stamens as long as or longer than the petals.—Montane on rocks, 6000 to 10,000 ft., e. slope of the Sierra Nevada in Mono Co., rare or occasional on the w. slope; e. to Utah. Var. PARÍSHII Jepson n. comb. Leaf-lobes of the older leaves mostly very short and rounded, entire or sparingly toothed; calyx-tube cylindric-turbinate, 2½ to 3 lines long.—San Bernardino Mts. (H. parishii Rydb.) Var. ÉLEGANS Jepson n. comb. Similar to var. parishii but calyx bright purple; flowers 3 to 4 lines long; calyx-tube cylindric or in age a little urnshaped; stamens not exserted.—San Gabriel Mts. (H. elegans Abrams.) Var. PRÍNGLEI Jepson n. comb. Leaves 4 to 8 lines broad, truncatish at base; petioles short (½ to ¾ or rarely to 2 in. long).—Montane, mostly 6000 to

10,000 ft., w. slope Sierra Nevada from Tulare Co. to Siskiyou Co. (H. pringlei Rydb.)

11. **TOLMIÈA** T. & G.

Perennial herb. Stems ending in a raceme. Leaves chiefly basal. Petals 5 or 4, filiform, subulate, elongated, inserted in the sinuses of the calyx, recurved, persistent. Calyx tubular, with 5 unequal lobes (2 large, 3 small), deeply cleft down one side, with protruding pistil. Stamens 2 or 3, with broad filaments, inserted in throat of calyx opposite the upper and lateral lobes. Calyx narrow. Ovary free from the calyx, long-oblong, attenuate at base, 2-cleft at apex; placentae 2, parietal; styles 2, slender. Capsule membranous, with 2 diverging equal beaks, tapering at base. (Dr. W. F. Tolmie, medical officer of the Hudson Bay Co. at Fort Vancouver in 1832 and after, botanical collector.)

1. **T. menzièsii** (Pursh) T. & G. Fig. 457. Stems slender, 1½ to 2¼ ft. high; leaves round-cordate or cordate-ovate, lobed, irregularly serrate, 1¼ to 3½ in. broad; flowers 4 lines long.—Woods along the coast, Mendocino Co. to w. Siskiyou Co.; n. to Alas. (Leptaxis menziesii Raf.)

457. Tolmiea menziesii T. & G.; *a*, leaf x ⅓; *b*, fl. stem x ⅓; *c*, fl. x 3; *d*, capsule x 1½.

12. **CHRYSOSPLÈNIUM** L. Golden Saxifrage

Low herbs with leafy stems, ours perennial and with opposite leaves. Flowers solitary, small, greenish-yellow. Calyx rotate, 4-lobed. Petals none. Stamens 4 or 8. Capsule 1-celled, with 2 parietal placentae. (Greek chrysos, gold, and splen, spleen, the plants used medicinally.)

458. Chrysosplenium glechomaefolium Nutt.; *a*, fl. branchlet x 1; *b*, fl. x 5; *c*, stamen x 15.

1. **C. glechòmaefòlium** Nutt. Fig. 458. Stems ascending, 5 to 10 in. long; leaves roundish, crenate, truncatish and entire at base, 3 to 7 lines long; flowers 1½ to 2 lines broad.—Mucky ground in shade, Mendocino and Humboldt coast; n. to B. C.

13. **PARNÁSSIA** L. Grass of Parnassus

Glabrous perennial herbs with entire leaves in a basal tuft. Stems scape-like, bearing a single terminal white flower and commonly a single small sessile leaf. Sepals slightly united at base. Petals greenish- or yellowish-veined, each bearing at base a cluster of gland-tipped sterile filaments. Stamens 5, alternate with the petals. Ovary 1-celled; stigmas 4 (or 3),

sessile, opposite the same number of placentae. Capsule 3 or 4-valved, the valves placenta-bearing along their middle. (Called Grass of Parnassus by Dioscorides, from Mt. Parnassus.)

Petals entire, not clawed, many-veined; leaves ovate, cuneate at base..... 1. *P. palustris.*

Petals fimbriate at the basal sides, clawed, few-veined.

Leaves oval; petioles 6 to 12 lines long, broad; staminodia 2 lines long; bract ovate..... 2. *P. cirrata.*

Leaves cordate to reniform; petioles 2 to 5 in. long; staminodia ½ line long; bract cordate..... 3. *P. fimbriata.*

1. P. palústris L. var. **califórnica** Gray. Fig. 459. Scape 9 to 16 in. high; leaves round-ovate to elliptic, 1 to 1¾ in. long, contracted at base into a petiole; petals oval or obovate, 6 to 9 lines long; sterile filaments capillary, 20 to 24 in a set, united to the middle. — High montane, wet meadows, 6300 to 11,000 ft., Sierra Nevada from Tulare Co. to Eldorado Co. and n. to Mt. Shasta; near the coast, 1500 to 2500 ft., Santa Cruz Mts. and Mt. Tamalpais and n. to southwestern Ore.

2. P. cirràta Piper. Similar to no. 1; rootstock more slender; petals not so broad. — Montane, uncommon:

459. Parnassia palustris var. californica Gray; *a*, habit x ⅓; *b*, long. sect. of fl. x ¾; *c*, gland x 1½; *d*, cross sect. of ovary x 2½.

North Fork San Gabriel River; Mt. San Bernardino; upper Sacramento River.

3. P. fimbriàta Konig. Also similar to no. 1; leaves ¾ to 1¾ in. broad.— Mountain meadows, Warner Mts., Modoc Co.; n. to Alas., e. to Col.

460. Philadelphus lewisii var. californicus Gray; *a*, fl. branchlet x ½; *b*, capsule x 2.

14. PHILADÉLPHUS L. Syringa. Mock Orange

Deciduous shrubs with opposite leaves. Flowers white, showy, in ours in a terminal raceme or thyrse. Calyx-limb 4 or 5-parted, valvate in the bud, persistent. Petals 4 or 5, convolute in the bud. Stamens 20 to 40. Ovary inferior, in ours 4-celled; styles 4 (3 to 5), distinct above the middle or at apex. Capsule loculicidally 4-valved, the valves commonly splitting a little at apex between the partitions; placentae projecting from above the middle of the axis, bearing many seeds. (Name of an Egyptian King, the application not obvious.)

1. P. lewísii Pursh var. **califórnicus** Gray. Fig. 460. Loosely branching, 4 to 11 ft. high; herbage varying from

glabrous or with very slight trace of pubescence to markedly hairy; leaves ovate, acute, commonly entire or a little dentate, 1½ to 3 in. long, on petioles 2 to 4 lines long; flowers ¾ to 1 in. broad; petals 4, elliptic; styles 2 or 3, distinct for the upper ⅔ or at apex.--Foothills and lower mountains, 800 to 4500 ft.: coastal mts. of s. Cal.; Sierra Nevada. Var. GORDONIÀNUS Jepson n. comb. More pubescent; leaves more freely dentate.—Along the coast, Humboldt and Del Norte Cos.; n. to B. C. (P. gordonianus Lindl.) The slender shoots of both varieties were used as arrow shafts for war and the chase by the native tribes.

15. CARPENTÉRIA Torr.

Shrub with opposite entire leaves and white flowers in a terminal cyme. Calyx 5 (or 6)-parted, its very short tube adnate to middle of ovary. Petals 5 or 6 (to 8). Stamens numerous (150 to 200). Ovary incompletely 5 (2 to 8)-celled, that is, with 5 (2 to 8) partitions originating on the walls and approximating but not united in the axis (unless at base), the inner margins bearing on each side a placental plate; placental plates projecting into the incomplete "cells" (2 plates to each "cell"), and bearing numerous ovules on both surfaces. Style one, short, bearing commonly 10 longitudinal stigmatic ridges, each pair of ridges representing a 2-lobed stigma. Capsule broadly conical, loculicidal. (Professor Carpenter of Louisiana.)

461. Carpenteria californica Torr.; *a*, fl. branchlet x ½; *b*, cross sect. of ovary x 1.

1. **C. californica** Torr. Fig. 461. Erect, 3 to 8 ft. high; leaves oblong, tapering to base and apex, the margins somewhat revolute, green and glabrous above, white-tomentulose beneath, 2 to 4 in. long, short-petioled; flowers 2 to 2½ in. broad; petals orbicular, rotately spreading.—Sierra Nevada foothills, 2000 to 3000 ft., between the San Joaquin River and Kings River: Backbone Creek; Grapevine Spring; Sycamore Creek. Local species.

16. JÀMESIA T. & G.

Shrubs with opposite deciduous leaves. Flowers in terminal cymose clusters. Calyx 5-lobed, its tube joined to lower part of the ovary. Petals spreading. Stamens 10, the alternate shorter; filaments dilated. Ovary conical, with 3 to 5 parietal placentae; styles 3 to 5. Capsule incompletely 3 to 5 or 7-celled. Seeds many, striate-reticulate. (Dr. Edwin James, botanist and historian of Long's expedition to the Rocky Mts., 1820.)

1. **J. americàna** T. & G. var. **californica** Jepson n. comb. Low shrub ½ to 3 ft. high, with shreddy gray or reddish bark, the young parts and calyces pubescent; leaves roundish to ovate, coarsely serrate, green and pubescent above, pale and densely strigose beneath, ½ to 1½ in. long, on short or sometimes long petioles; flowers deep pink; calyx-lobes narrow-ovate, acute, rarely obtuse; petals oblong or obovate, obtuse, 3½ lines long; capsule (including the persistent styles) 5 lines long, surpassing the now lanceolate calyx-lobes.—Granite cliffs and rocky cañon walls, 8500 to 12,000 ft.: s. Sierra Nevada from Palisade Creek, Fresno Co., to Kern Cañon, Sawtooth Range and Mt. Whitney; Panamint Mts. (Edwinia californica Small.)

17. WHÍPPLEA Torr.

Small low under-shrub with opposite leaves. Flowers small, white, in short racemes on a terminal naked peduncle. Calyx-tube wholly adnate to the

lower portion of the ovary which is about ⅔ free. Stamens 8 to 12, those opposite the petals somewhat shorter, the filaments all dilated at the base or below the middle. Ovary 3 to 5-celled, with a single suspended ovule in each cell; styles 3 to 5, distinct, subulate, deciduous. Capsule septicidally dehiscent into 3 to 5 cartilaginous 1-seeded portions which open down the ventral suture. (Lieut. A. W. Whipple, U. S. Army, commander of the Pacific Railroad Expedition from the Mississippi River to Los Angeles in 1853 and 1854.)

1. **W. modésta** Torr. Stems slender, diffuse or trailing; herbage and calyx-tube pubescent; calyx-lobes glabrous; leaves ovate or oval-ovate, 3-nerved, crenate above the middle, ¾ to 1¾ in. long, short-petioled; racemes capitate or nearly so, about 4 to 9-flowered, the flowers soon becoming somewhat greenish; petals oblong or ovate, contracted at base, ¾ to 1¼ lines long, larger than the linear calyx-lobes; capsule globular.—Woods and thickets, Coast Ranges from Monterey Co. to Solano and Humboldt Cos.; n. to Ore.

18. RÌBES L. Gooseberry. Currant

Shrubs, either unarmed or prickly. Leaves alternate, palmately lobed, the stipules adnate or none. Flowers in racemes or solitary, the pedicels with bractlets. Calyx-lobes, petals and stamens 5 in all ours except R. speciosum. Calyx-tube adnate to the 1-celled ovary and more or less produced beyond it. Petals inserted on the throat of the calyx, the stamens alternating with them. Placentae 2, parietal. Styles 2, distinct or more or less united; stigma terminal. Fruit a berry. (Ancient Arabic name.)

A. Stems unarmed; berry spineless; peduncles bearing a several to many-flowered raceme.—Subgenus Ribesia (Currants).

Flowers yellow; leaves convolute in the bud.....1. *R. aureum.*
Flowers red, white, or greenish; leaves plaited in the bud.
  Calyx-tube cylindric or campanulate.
    Flowers white or greenish white.
      Calyx-tube cylindric, 2½ to 3 times as long as broad; berry crimson.....
        2. *R. cereum.*
      Calyx-tube campanulate, 1 to nearly 2 times as long as broad; berry black..
        3. *R. viscosissimum.*
    Flowers pink or red.
      Calyx-lobes erect in anthesis, the calyx-tube bowl-shaped....4. *R. nevadense.*
      Calyx-lobes rotate or recurving in anthesis.
        Style glabrous; leaves thinnish.....5. *R. sanguineum.*
        Style pubescent; leaves thickish.....6. *R. malvaceum.*
  Calyx-tube rotately spreading or saucer-shaped; leaves resinous-dotted below.
    Leaves maple-like, deciduous.
      Stems ascending; ovary with stalked glands.....7. *R. laxiflorum.*
      Stems erect; ovary with sessile glands.....8. *R. bracteosum.*
    Leaves leathery, evergreen.....9. *R. viburnifolium.*

B. Stems bearing spines at the nodes below the leaves and often prickly; berry spiny or spineless; peduncles mostly 1 to few-flowered.—Subgenus Grossularia (Gooseberries).

Flowers 5-merous; petals much shorter than the calyx-lobes; calyx-lobes reflexed in flower, later erect; stamens exserted or not exserted.
  Calyx-tube rotately spreading or saucer-shaped; berry with gland-tipped hairs.
    Leaves glabrous or nearly so; berry black.....10. *R. lacustre.*
    Leaves very glandular-sticky; berry red.....11. *R. montigenum.*
  Calyx-tube cylindric or campanulate.
    Styles hairy; ovary and berry glabrous and spineless.
      Stamens longer than the calyx-lobes.....12. *R. divaricatum.*
      Stamens shorter than the calyx-lobes.....13. *R. inerme.*
    Styles glabrous.
      Berry spineless, sometimes glandular-hairy.
        Ovary and berry glabrous.
          Calyx-tube 1¼ to 2 times as long as the calyx-lobes.....
            14. *R. leptanthum.*
          Calyx-tube ¾ to as long as the calyx-lobes....15. *R. quercetorum.*
        Ovary and berry more or less hairy.....16. *R. velutinum.*
      Berry spiny.
        Anthers lanceolate to linear, apiculate or constricted at apex; stamens 1½ to 2 times longer than the petals.
          Calyx-tube much longer than broad.
            Berry with long glandless spines, sometimes also with very short glandular ones.....17. *R. roezlii.*

Berry with very short regular gland-tipped spines.....
18. *R. amarum.*
Calyx-tube as broad or nearly as broad as long.
Calyx lurid purple to greenish white.
Leaves glabrous or nearly so and non-glandular; ovary with mostly equal non-glandular bristles.....
19. *R. californicum.*
Leaves mostly pubescent and mostly glandular below; ovary with long and short more or less gland-tipped bristles.....20. *R. menziesii.*
Calyx dull white; leaves and especially petioles more or less viscid-glandular .....21. *R. victoris.*
Anthers oval or elliptic, not apiculate at apex.
Stamens scarcely exceeding the petals; calyx greenish-white; berry with very unequal spines; leaves pubescent.....
22. *R. binominatum.*
Stamens twice as long as the petals; calyx crimson or red; berry with subequal spines.
Leaves glabrous or nearly so.
Calyx-tube about as broad as long; berry with long gland-less spines.....23. *R. marshallii.*
Calyx-tube longer than broad; berry with very short glandular spines.....24. *R. lobbii.*
Leaves soft pubescent, commonly with intermixed short bristly hairs.....25. *R. sericeum.*
Flowers 4-merous, red, showy; petals as long as the calyx-lobes; calyx-tube short, swollen into a ring or annulation, its lobes erect; stamens long-exserted.26. *R. speciosum.*

1. **R. aúreum** Pursh. GOLDEN CURRANT. Shrub 4 to 8 ft. high, nearly glabrous, not glandular; leaves ½ to 1⅛ in. broad, 3 to 5-lobed, mostly obtuse or truncate at base, the lobes rounded, entire or few-toothed or incised; racemes about 1 in. long, loose, with few to several flowers, the bracts foliaceous; flowers golden yellow, spicy fragrant; calyx salverform, its slender tube 2 to 3 times the length of the oval lobes; lobes 1½ to 2 lines long; stamens not surpassing the petals; ovary glabrous; berry yellow, crimson or black, 2 to 3 lines long.—Moist land or banks of streams or lakes, interior plateau, e. of the Sierra Nevada from Inyo Co. to Siskiyou Co.; n. to B. C., e. to Rocky Mts. Var. GRACÍLLIMUM Jepson n. comb. Flowers "scentless"; calyx-tube more slender and its lobes shorter (1½ to 2 lines long).—Coastal: Wildcat Creek, Contra Costa Co.; Mt. Hamilton Range; Templeton; s. to Glendora and Riverside. (R. gracillimum Cov. & Britt.)

462. Ribes cereum Dougl.; fl. branchlet x 1.

2. **R. céreum** Dougl. Fig. 462. Low broad much branched bush 1 to 3 or 5 ft. high; foliage pleasantly but somewhat heavily fragrant; leaves minutely glandular, ¾ to 1 in. (less commonly ½ to 1¼ in.) wide, shallowly 3 (or 5)-lobed or cleft, the lobes serrate or incised; racemes drooping, 2 to 9-flowered; flowers 4 to 5 lines long; calyx white or pinkish, tubular, its short lobes rotate, white; stamens included, with very short filaments, inserted high on the tube; petals white, very small, the blade transversely oblong with a very short broad claw; berry crimson, glabrous, or with minute gland-tipped hairs; 3 lines in diameter.—High montane, 6200 to 12,050 ft.: Mt. Shasta and Modoc Co. south through the Sierra Nevada to Mt. Pinos and the San

463. Ribes viscosissimum Pursh; *a*, fl. branchlet x ½; *b*, fl. x 1; *c*, fr. x 1.

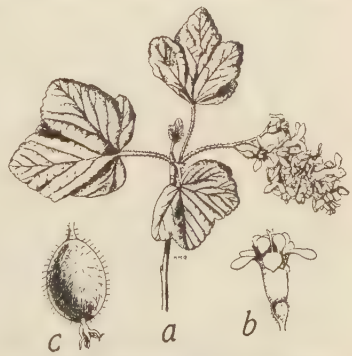
Gabriel, San Bernardino and San Jacinto mountains; e. to Rocky Mts., n. to B. C.

3. **R. viscosíssimum** Pursh. Fig. 463. Leafy shrub 1 to 3 ft. high, with reddish shreddy bark and fragrant foliage; herbage glandular-hispidulose and also puberulent, especially on the branchlets and petioles; leaves cordate-rounded, shallowly 3-lobed with rounded lobes and open sinuses, crenate, 1½ to 2½ in. broad; racemes ascending, short, somewhat corymb-like, 3 to 13-flowered; bracts oblong, conspicuous; flowers 8 lines long; pedicels 2 to 5 lines long; calyx greenish or pinkish, its tube nearly as broad as long, its oblong lobes at least ½ length of tube; petals dull white, broadly ovate, very obtuse, their tips approximate and so narrowing the opening a little; stamens not exceeding the petals; ovary covered with gland-tipped hairs; berry black, more or less glandular-bristly.—High mountains, 8000 to 9500 ft.: Sierra Nevada from Tulare Co. to Mariposa Co.; e. to Rocky Mts., n. to B. C. Passing by intermediate states into the var. HÁLLII Jancz. Calyx purple-tipped; ovary glabrous; berry with a bloom.—Sierra Nevada from Mariposa Co. n. to Modoc Co., thence w. to Mt. Shasta and Trinity Summit.

464. Ribes nevadense Kell.; *a*, fl. branchlet x ½; *b*, fl. x 2; *c*, fr. x ⅔.

4. **R. nevadénse** Kell. Fig. 464. Slender diffuse or erect shrub 3 to 6 ft. high; foliage and racemes similar to R. sanguineum, but the flowers very much shorter; calyx reddish, 1 to 2 lines long, its tube short and broad, almost bowl-shaped, its lobes erect; petals white, slightly shorter than the calyx-lobes; style very short; berry blue-black but covered with a white bloom.—Higher mountains, 4500 to 7000 ft.: North Coast Ranges from Trinity Co. to Siskiyou Co.; Sierra Nevada from Shasta Co. to Tulare Co.; s. to the San Gabriel, San Bernardino and San Jacinto mountains.

5. **R. sanguíneum** Pursh. FLOWERING CURRANT. Stems slender, erect or spreading, 4 to 9 ft. high; bark brownish, shreddy; foliage sticky when young; leaves roundish-cordate in outline, 3-lobed or with 2 supplementary lobes, rather finely serrate, 1½ to 3 in. broad, green above, pale pubescent or tomentulose beneath; stipules glandular-bristly; racemes erect, rather long-peduncled; bracts crimson; flowers blood red, 6 to 7 lines long; calyx funnelform, its lobes ascending; petals short-spatulate; ovary sprinkled with short stipitate glands, otherwise glabrous, rarely puberulent; berry blue-black, with bloom, 4 to 5 lines in diameter.—High montane: Siskiyou and Del Norte Cos.; n. to B. C. Var. GLUTINÒSUM Loud. Fig. 465. Racemes drooping; flowers deep or pale pink.—Cañons or on northward slopes near the coast from San Luis Obispo Co. to Berkeley and Mt. Tamalpais and n. to Del Norte Co.; common. Var. DEDÚCTUM Jepson n. comb. Six to 16 ft. high; leaves thin; flowers pale or whitish, few in a mostly loose drooping raceme; berry ripening slowly.—Very dense shade of forests: San Mateo Co.; Berkeley; Eureka. Local ecological form, perhaps not of even varietal value. (R. deductum Greene.)



465. Ribes sanguineum var. glutinosum Loud.; *a*, fl. branchlet x ⅓; *b*, fl. x 1; *c*, fr. x ⅔.

6. **R. malvàceum** Sm. Stems stout, usually many from the base, strictly erect and compact, 4 to 6 ft. high; leaves thick, conspicuously rugulose, slightly glandular-scabrous above, more or less white-tomentulose beneath, ¾ to 2¼ in. broad; flowers rose-color, very pale pink or whitish, 4 to 5 lines long; calyx broadly cylindric, its lobes rotate or spreading; petals very broad, truncate; ovary white-hairy and with short gland-tipped hairs; berry ripening very rapidly, glaucous, somewhat hispidulous or hairy, the pulp soft and sweet.—Wooded or dry open hills: inner North Coast Range from Tehama Co. to Mt. Diablo; Marin Co.; s. to coastal S. Cal. Dec.-Apr. Var. VIRIDIFÒLIUM Abrams. Foliage greener than in the species and inflorescence more glandular.—San Gabriel Mts. Var. INDECÒRUM Janez. Flowers whitish, nearly sessile, 2½ to 3½ lines long; style very short.—Dry chaparral belt, Ventura Co. to San Diego Co.

7. **R. laxiflòrum** Pursh. Stems decumbent or ascending, 3 to 8 ft. long; leaves roundish cordate in outline, nearly glabrous above, pubescent beneath, 2½ to 5 in. broad, 5-lobed or with 2 supplementary lobes at base, serrate; racemes erect, 1½ to 4 in. long; pedicels 2½ to 6 lines long; bracts lanceolate; flowers purplish; calyx saucer-shaped, 3 lines broad; petals minute, fan-shaped, truncate or retuse, short-clawed; ovary, pedicels and rachis whitish pubescent, the former densely, the latter two lightly sprinkled with long-stalked glands; berry black, 2 to 3 lines long, with a few long-stalked glands.—Wet places in woods, Humboldt Co.; n. to B. C. and Alas.; Siberia. Apr.

8. **R. bracteòsum** Dougl. STINK CURRANT. Tall erect shrub 4 to 8 or 14 ft. high; leaves large, deeply 5-lobed with doubly serrate divisions, 2 to 8 or 10 in. broad, nearly glabrous but the upper side minutely strigulose, the under side sprinkled with resin dots; petioles long; racemes erect, 5 to 7 in. long, with numerous (30 or more) "greenish-white" flowers; bracts persistent, filiform or lanceolate, the lower petioled; calyx rotately expanding or saucer-shaped; petals minute; stamens very short; berry black, covered with a bloom, resin-dotted, 4 lines long.—Stream banks and bottoms along the coast: Mendocino Co. to Del Norte Co.; n. to Ore. and Alas. May-June.

9. **R. viburnifòlium** Gray. Straggling evergreen bush; leaves glabrous, leathery, oval, rounded at apex or sometimes retuse, entire or sparsely crenate, 9 to 14 lines long, sprinkled beneath with resin dots; racemes erect; pedicels long, filiform; flowers small, pink; calyx rotate; petals minute, ¼ as long as the calyx-lobes; stamens very short; berry glabrous.—Santa Catalina Isl.; L. Cal.

10. **R. lacústre** Poir. SWAMP GOOSEBERRY. Stems prostrate or ascending, 3 to 4 ft. long; spines at the nodes 3, the stems prickly or sometimes naked; leaves nearly or quite glabrous, ¾ to 2¼ in. broad, deeply and incisely 3 or 5-lobed with mostly open sinuses, the lobes incised and serrate; racemes at first erect, later recurving, 1 to 2 in. long, with 7 to 12 greenish flowers on pedicels 2 to 3 lines long; calyx saucer-shaped; stamens about the length of the petals, minute; ovary with scattered gland-tipped prickles, otherwise glabrous; berry black, 2 lines broad, with weak gland-tipped bristles.—Cold wet mountain meadows, 5000 to 6000 ft., Humboldt Co. to Siskiyou Co.; n. to Alas., e. to N. Eng.

466. Ribes montigenum McCl.; *a*, fl. branchlet x 1; *b*, fl. from above x 2.

11. **R. montígenum** McCl. Fig. 466. Low or straggling, much branched, 1 to 2 ft. high, the stems with 1 to 3 or 4 spines at the nodes, the internodes bristly-prickly or nearly naked; herbage short-pubescent, glandular-sticky; leaves small (4 to 8 lines broad), 3 to 5-parted, the lobes incised; flowers reddish brown, peduncles short; racemes 5 to 7-flowered,

the pedicels very short; calyx greenish, fading pinkish, its tube saucer-shaped, 2½ to 3 lines broad; petals dull crimson or deep red, fan-shaped, ⅓ line long; stamens inserted in the sinuses of the glandular 5-lobed disk, very short; ovary hairy and with glandular prickles intermixed; berry light red with scattered gland-tipped or rarely glandless bristles or sometimes smooth, 2½ lines in diameter.—Dry slopes on high mountains, 7500 to 12,500 ft.: San Gabriel, San Bernardino and San Jacinto mountains; Sierra Nevada from Tulare Co. to Placer Co. and n. to Siskiyou Co.; e. to Rocky Mts., n. to B. C.

12. **R. divaricàtum** Dougl. Straggly Gooseberry. Fig. 467. Shrub 4 to 6 ft. high, with very long straggling branches; bark whitish or dull gray; herbage glandular when young; spines at the nodes 1, sometimes 3; leaves green and only minutely pubescent above, pubescent or puberulent and usually pale beneath, ¾ to 1½ (or 2¼) in. broad, 3 to 5-cleft, truncate or subcordate at base, rarely rounded; racemes drooping, loosely 3 to 5-flowered, sometimes 2 or 6-flowered; pedicels 3 to 4 lines long, with a small roundish bract at base; flowers 3 to 5 lines long; calyx-lobes broadly oblong, obtuse,

467. Ribes divaricatum Dougl.; *a*, fl. branchlet x 1; *b*, long. sect. of fl. x 4; *c*, fr. cluster x 1.

green without, dull purple within, longer than the bowl-shaped tube; petals white, fan-shaped, plane, ½ to 1 line long; stamens and style exserted, the latter deeply cleft, densely long-villous at the middle; ovary and berry glabrous and spineless.—Shaded cañon bottoms and flats: Coast Ranges, mostly near the coast, from San Bernardino Valley to Humboldt Co.; Shasta Co. to Lassen Co.; n. to B. C.

13. **R. inérme** Rydb. Stems slender, often simple, 2 to 5 ft. high; bark whitish; spines at nodes 1 to 3, short (1 to 2 lines long) or none; prickles none; leaves quite glabrous or sparingly pubescent, especially beneath, 1 to 2 in. broad, subcordate, 5-cleft, the lobes incisely toothed; petioles usually with a few scattered bristles; flowers 1 to 3, nodding, greenish or purplish, 3 lines long; ovary and calyx characteristically glabrous, the calyx-tube about as long as the lobes; stamens twice as long as the minute petals; style villous below the middle; ovary glabrous; berry smooth, glabrous,

dark purple, 4 lines in diameter.—Mountains, 3500 to 8000 ft.: Sierra Nevada from Tulare Co. n. to Modoc and Siskiyou Cos.; e. to Rocky Mts., n. to Alb. and B. C. The berries make an agreeable sharp sauce and are prized by the mountaineers. Var. KLAMATHÉNSE Jepson n. comb. Leaves villous; calyx hirsute; berry black (ex char.).—Siskiyou Co.; s. Ore. (Grossularia klamathensis Cov.)

14. **R. leptánthum** Gray var. **lasiánthum** Jepson n. comb. Freely, intricately and rigidly branched, forming low round bushes 1 to 3 ft. high; bark white, shreddy; stems with 1 to 3 slender spines at the nodes, rarely with prickles; leaves minutely puberulent or nearly glabrous, 4 to 6 lines wide, roundish, deeply cleft, the petioles pubescent; racemes 1 or 2 (rarely 3 or 4)-flowered; calyx yellow, its tube cylindrical, 3 to 4 lines long (2 to 3 times as long as broad), hairy-pubescent; petals yellowish, equaling the stamens, often annular-dilated above the ovary; ovary glabrous; berry smooth, crimson, 2½ to 3½ lines in diameter.—High mountains, 7000 to 10,000 ft.: Sierra Nevada from Tulare Co. to Nevada Co. (R. lasianthum Greene.)

15. **R. quercetòrum** Greene. Bush 2 to 4 ft. high; stems not at all or sparingly bristly; spines mostly solitary; leaves deeply cleft and incised-toothed, finely puberulent, rarely subglabrous, usually minutely glandular, 4 to 6 lines broad; flowers 3 to 4 lines long; calyx-lobes little longer than the petals; calyx yellow, minutely puberulent, its tube nearly as broad as long in early anthesis; petals a little longer than the stamens; style glabrous, undivided; ovary and berry glabrous and smooth; berry 2½ to 3 lines in diameter.—Foothills, on open oak-covered or rocky slopes, Sierra Nevada from Tuolumne Co. to Kern Co.; South Coast Ranges from Monterey Co. southward; in or near the San Jacinto Range and southwards.

16. **R. velûtinum** Greene. Similar to R. leptanthum; leaves minutely and often densely pubescent; calyx yellow, its tube very short (1 line long), as broad as or broader than long in the fresh flower; ovary lightly or densely hairy, the hairs sometimes gland-tipped and bristle-like.—Mountain slopes, mostly of the interior plateau, 3000 to 8200 ft.: Trinity Co. to Siskiyou Co., e. to Modoc Co., thence s. on the e. side of the Sierra Nevada to Mt. Pinos; Ore. to Utah and Ariz. Var. GLANDULÍFERUM Jepson n. comb. Berry densely (sometimes sparsely) covered with long gland-tipped hairs, and also more or less finely pubescent.—Siskiyou, Tulare and Kern Cos. (R. glanduliferum Hel.)

468. Ribes roezlii Regel.; fl. and part of stem x 1½.

17. **R. róezlii** Regel. Fig. 468. Stout shrub 2 to 3 or 5 ft. high and half again or twice as broad, with many long diffusely spreading branches; nodes with 1 to 3 spines; prickles none; leaves pubescent or glabrous, 3 to 5-cleft into toothed lobes, 6 to 11 lines broad; pedicels 1 (or 2)-flowered; flowers dull red, 6 to 8 lines long; calyx dull red, puberulent, often densely whitish-pubescent, its tube 1½ to 2 times longer than broad, as long or nearly as long as the lobes; petals white, involute, over half as long as the stamens; ovary densely white-hairy or at least pubescent, the long bristles intermixed with some short gland-tipped bristles; bristles pubescent or short pilose; berry yellowish, pinkish or purplish, or becoming deep red-brown when ripe, 6 to 7 lines in diameter, beset with long stout more or less pubescent spines.—Mountain slopes and cañon valleys, 3500 to 7000 ft.: mts. of coastal S. Cal.; Mt. Pinos; Sierra Nevada (the most common gooseberry at middle altitudes); n. to Modoc Co., thence w. to Humboldt Co. Var. CRUÉNTUM Rehd. Leaves more commonly glabrous; calyx glabrous; ovary glabrous, densely covered with long glabrous bristles which are set about at base with a rather dense layer of stiped glands; spines of the berry numerous, non-glandular and non-pilose.—North Coast Ranges, in the middle and inner ranges. Berry somewhat suggestive of a small chinquapin bur. (R. cruentum Greene.)

469. Ribes californicum H. & A.; *a*, fl. branchlet x ⅔; *b*, long. sect. fl. x 2⅔.

18. **R. amàrum** McCl. Similar to R. menziesii but the stems not prickly; flowers 6 to 8 lines long; calyx funnelform, puberulent and somewhat stipitate-glandular, its tube twice as long as broad, its lobes broad, red-purple; petals nearly as long as the filaments; ovary very densely covered with very short gland-tipped bristles, also somewhat glandular and often puberulent; berry 5 to 6 lines in diameter, densely covered with short stout spines; skin of berry tough, nauseous; spines more or less glandular, ¼ to 1½ lines long. — Mountain cañons, 1000 to 4000 ft.: coastal S. Cal., n. in the Sierra Nevada to Mariposa Co.

19. **R. californicum** H. & A. HILLSIDE GOOSEBERRY. Fig. 469. Compact shrub, with more or less flexuous branches, 2½ to 4 ft. high; nodal spines 3 (or 1); prickles none; leaves ½ to 1½ in. broad, 3 to 5-cleft, crenate, glabrous or nearly so, and non-glandular; flowers solitary (sometimes 2), 4 to 5 lines long; pedicels with a couple of shallowly lobed bracts at middle; calyx greenish, dull white, or sometimes purplish-tinged, glabrous, rarely puberulent, sometimes the lobes tipped with a few pilose hairs; petals white, ¼ to ⅓ as long as the stamens; ovary glabrous or sometimes puberulent, covered with rather long bristles, sometimes interspersed with shorter gland-tipped bristles; berry usually small, 3 to 4 or 5 lines in diameter, the spines slender.—Hills or narrow cañon flats, most characteristic of dry exposed or rocky slopes, central Coast Ranges from Monterey Co. to Mendocino Co. Jan.-Apr. Var. OLIGACÁNTHUM Jepson n. comb. Berry with strikingly few spines, the spines strong and conspicuously scattered, or smooth and unarmed.—Santa Cruz Mts. to Monterey Co. Armed and smooth berries may be found on a single branchlet. (R. oligacanthum Eastw.) Var. HESPÈRIUM Jepson n. comb. Calyx reddish-purple; petals nearly as long as the filaments; ovary and berry glabrous or sometimes puberulent, densely covered with slender spines; all the spines non-glandular, or a few shorter ones gland-tipped.—S. Cal. mts. Related in the color and size of its flower to R. menziesii and in its spiny bur-like fruit to R. roezlii var. cruentum. It has one or more points of difference with several allied species but no one character different at once from all of them. (R. hesperium McCl.)

20. **R. menzièsii** Pursh. CAÑON GOOSEBERRY. Fig. 470d. Tall openly branched shrub, 4 to 8 ft. high; stems with mostly 3 spines at the nodes, usually densely prickly and more or less glandular-pubescent; leaves 3 to 5-cleft, serrate, subcordate at base, subglabrous above, pubescent and glandular beneath, 1 to 1½ in. broad; pedicels 1 or 2-flowered; flowers 5 to 6 lines long; calyx more or less glandular-pubescent or -hairy, its lobes lurid-purple, 3 to 4 lines long, closely reflexed; petals white, waxy, involute, often crenulate, 2 lines long, over half as long as the stamens; style exceeding the stamens, 2-cleft at apex; ovary pubescent and densely bristly, the bristles all or mostly gland-tipped; berry 5 to 7 lines in diameter, the numerous spines very short (½ to 1 line long), more or less glandular.—Cañons and flats near the coast from San Luis Obispo Co. to Humboldt Co.; n. to southern Ore. Jan.-Mar. Var. SENÌLE Jepson n. comb. Ovary markedly white-pilose between the bristles.—Santa Cruz Mts. (Grossularia senilis Cov.) Var. HÝSTRIX

Jepson n. comb. Stems often densely setose-spiny; nodal spines yellow, often very stout and long (mostly 6 to 11 lines); leaves chartaceous.—Santa Lucia Mts., along the coast. (R. hystrix Eastw.) Var. LEPTÓSMUM Jepson n. comb. Fig. 470a, b, c. Stems without prickles or sparingly prickly; stamens about twice the length of the petals; ovary very densely and evenly

470. *a*, Ribes menziesii var. leptosmum Jepson; fl. branchlet x 1; *b*, long. sect. fl. x 2; *c*, berry x 1; *d*, R. menziesii Pursh; berry x 1.

covered with stiped glands (in the extreme form as if tesselated), soon developing into unequal gland-tipped bristles.—Hill cañons about San Francisco Bay. (Grossularia leptosma Cov.)

21. **R. victòris** Greene. VICTOR'S GOOSEBERRY. Low bush 1½ to 2 ft. high, the slender stems with 1 to 3 weak spines at the nodes, the newer branches prickly; foliage sparsely strigulose or hirsutulous and more or less viscid-glandular, especially on the petioles; leaves ½ to 1 in. broad, crenately incised, 5-lobed, the lower pair of lobes much smaller; pedicels 5 lines long, 1 or 2-flowered; flowers 5 to 6 lines long; sepals dull white; petals clear white, about ⅔ the length of the stamens; ovary covered with stiped glands, sometimes as if tesselated; berry mostly oval, golden yellow, 6 to 8 lines in diameter, very densely covered with slender but short glandular spines.—Shady cañons, Marin, Sonoma and Napa Cos. Var. GREENEIÀNUM Jepson n. comb. Leaves 1¼ to 1¾ in. broad; pedicels slender, 1 to 1¼ in. long; flowers 7 to 9 lines long; petals about ½ the length of the stamens. —Cañons, e. slope of the Vaca Mts. (R. greeneianum Hel.) Var. MÌNUS Jepson n. comb. A form of the rocky hills with smaller flowers (4 to 5 lines long).—Hood's Peak and Napa ranges. (R. menziesii var. minus Jancz.)

22. **R. binominàtum** Hel. Stems trailing, not bristly, 2 to 4 ft. long; nodal spines 3, unequal; leaves 3 to 5-cleft, ¾ to 1½ in. broad, glabrous or weakly pubescent and often glandular above, more or less silky-pubescent beneath;

calyx greenish white, villous, 4 to 5 lines long, its tube very short, the lobes twice as long; stamens little exceeding the petals; berry usually glandular, covered with stout-based yellowish spines of very unequal length.—Montane, 5000 to 6000 ft., uncommon: Tulare Co.; Siskiyou Co.

23. **R. marshállii** Greene. Low, spreading, sometimes forming almost matlike colonies 3 to 7 ft. across; flowers similar to those of R. lobbii; calyx-tube bowl-shaped, as broad or broader than high; calyx-lobes crimson, 2 lines broad, 6 to 7 lines long; anthers glandless; ovary white-woolly, with non-glandular bristles imbedded in the tomentum; berry subglobose, 6 to 7 lines in diameter, covered with long glandless spines.—Montane, 6000 to 7000 ft., n. Humboldt Co. to w. Siskiyou Co.

24. **R. lóbbii** Gray. Bush 2 to 3 ft. high; herbage sparingly glandular-pubescent; spines at nodes 3; leaves ¾ to 1¼ in. broad, 3-lobed and serrate, sparsely hispidulose; peduncles 1 to 3-flowered; flowers pendulous, 10 to 11 lines long; calyx crimson or Turkish red, sparingly hairy outside, its tube cylindric, longer than broad; calyx-lobes long-oblong, somewhat spreading or recurved-coiling, longer than the tube; petals involute, yellow; stamens and style much exserted; anthers densely glandular-dotted on the back; ovary densely covered with stipitate glands as if tesselated, half-sheathed or closely subtended by a truncate bract; berry oval, 6 to 8 lines long, densely covered with gland-tipped short spines.—Montane, 5500 to 6500 ft., n. Humboldt Co.; n. to B. C.

25. **R. sericeum** Eastw. Stems very prickly, the prickles bristle-like; herbage with a short-pilose whitish pubescence; leaves thinnish, deeply 3 (or 5)-cleft; raceme (1 or) 2-flowered, on peduncles ¾ to 1¼ in. long; peduncles slender, white-pilose and bristly with gland-tipped bristles; flowers 9 to 11 lines long; sepals red, sparingly villous; petals rather less than half as long as the stamens; anthers drab or tan-color, not apiculate; ovary densely covered with gland-tipped bristles and intervening white hairs; berries often large (8 to 11 lines in diameter).—Santa Lucia Mts., mostly along the coast.

26. **R. speciòsum** Pursh. Tall evergreen shrub 4 to 10 ft. high; branches prickly or almost smooth; spines at nodes 3, very stout (5 to 8 lines long); leaves small (6 to 8 lines long, rarely to 1 or 1½ in. long), coriaceous, nearly evergreen, roundish elliptic to obovoid, roundish or cuneate at base, slightly 3-lobed or -toothed at apex; peduncles 1 or 2-flowered; flowers crimson, 5 to 6 lines long; calyx crimson, its lobes erect, 4 to 5 lines long, the tube above the ovary very short (1 line long), forming a swollen ring; petals involute, narrow, truncate, almost as long as the calyx-lobes; stamens exserted, 8 to 11 lines; anthers oval; ovary densely bristly, the bristles with discoid glands at tip; berry dry, very bristly.—Near the coast, Santa Clara Co. to Monterey Co. and s. to San Diego Co.

CROSSOSÒMATÀCEAE. Crossosoma Family

Glabrous shrubs with alternate entire leaves. Flowers regular, solitary, terminal, borne on short naked peduncles arising from winter buds. Calyx 5-lobed, persistent. Petals 5, white. Stamens 15 to 50, inserted in 3 or 4 ranks on a thin disk lining the open calyx-tube; filaments somewhat dilated. Stigma capitate. Follicles 2 to 9, contracted at base into a short or obscure stipe. Seeds several, furnished with a fimbriate aril. Endosperm slightly fleshy; embryo curved.

1. CROSSOSÒMA Nutt.

The only genus. (Greek krossoi, fringe, and soma, body, in reference to the aril.)

Leaves scattered; petals roundish, scarcely clawed.....1. *C. californicum.*
Leaves fascicled; petals oval or obovate, distinctly clawed.....2. *C. bigelovii.*

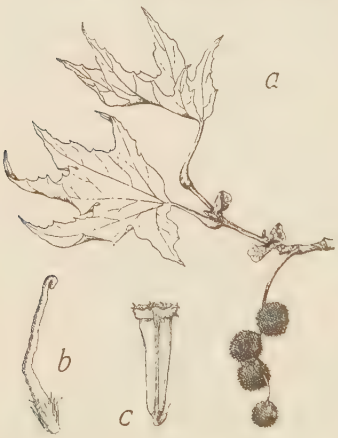
1. **C. califórnicum** Nutt. Shrub 3 to 6 ft. high, or somewhat arboreous and up to 15 ft. high; leaves scattered, oblong (or sometimes obovate), tapering slightly to the somewhat obtuse mucronate apex, tapering more strongly to

the shortly-petioled base, 1½ to 3½ in. long; flowers numerous, 10 to 14 lines broad; sepals round-ovate, obtuse, scarious-margined; petals obliquely roundish, crinkled; stamens about 40 to 50; follicles 3 to 7 (or 9), oblong-cylindric, 6 to 10 lines long, 20 to 25-seeded.—Catalina Isl. Also on Guadaloupe Isl. May.

2. **C. bigelòvii** Wats. Erect bush 3 to 4 ft. high, with slender branches and short rigid branchlets; leaves mostly fascicled, glaucous, ovate-oblong, sometimes obovate, obtusish and apiculate, 4 to 9 lines long, subsessile: peduncles 3 lines long; flowers white or purplish, 3½ to 5 or 8 lines broad; petals oval or obovate, with cuneate claw; stamens 15 to 21 "or 30"; follicles 2, rarely 3 or 1, 2 to 5-seeded, 3 to 4 lines long.—Rocky cañons in the Colorado Desert, 100 to 700 ft.; e. to Ariz., s. to L. Cal. Apr.

PLATANÀCEAE. Plane Family

Trees with large alternate palmately lobed leaves. Buds concealed in the hollow base of the petiole. Bark falling away in thin plates. Flowers small, greenish, in dense ball-like heads, monœcious. Sepals and petals none. Stamens and pistils in separate heads, crowded on a globose fleshy receptacle. Stamens with long anthers and very short filaments. Pistils with interspersed bracts; ovary 1-ovuled; style 1. Fruit a small nut.



471. Platanus racemosa Nutt.; *a*, branchlet with string of balls x ⅙; *b*, pistil x 6; *c*, stamen x 6.

1. PLÁTANUS L. Plane Tree

The only genus. (Greek platus, broad, referring to the ample leaves.)

1. **P. racemósa** Nutt. Western Sycamore. Fig. 471. Tree 40 to 90 ft. high, often leaning; leaves 3 to 5-lobed, usually cordate or truncate, thick and firm, tomentose, 4 to 9 in. long, the lobes usually entire.—Stream bottoms and river banks in dry country: Great Valley and bordering foothills; South Coast Ranges; coastal S. Cal.

ROSÀCEAE. Rose Family

Herbs, shrubs or trees. Leaves alternate, commonly with stipules. Flowers regular, commonly perfect, solitary or in clusters. Calyx 5 (or 4)-lobed. Petals 5, rarely none. Stamens 10 to numerous, rarely fewer, usually indefinite, inserted with the petals on the calyx or on the edge of a disk that lines the calyx-tube. Pistils 1 to many, simple, distinct and free from the calyx, or united into a 2 to 5-celled ovary which is nearly or completely inferior. Fruit a pod (follicle), an achene, a drupe, a cluster of drupelets (as in a blackberry) or a pome. Seeds with straight embryo; endosperm usually none.—The calyx in certain genera appears double by reason of a row of bractlets borne at or near the sinuses. Coleogyne and Lyonothamnus have opposite leaves.

A. Ovary superior.

1. Fruit dehiscent, consisting of 2 to 5 dry pods or follicles; trees, shrubs or herbs.—Tribe Spireae.

Flowers perfect.
- Calyx-lobes deciduous; leaves opposite, dimorphic; trees.....1. Lyonothamnus.
- Calyx-lobes persistent; leaves alternate; shrubs.
  - Stamens distinct; erect shrubs.
    - Leaves simple.
      - Pods inflated, dehiscent, 2 to 4-seeded; flowers white..2. Physocarpus.
      - Pods not inflated.
        - Stamens well exserted; flowers mostly rose-color; pods several-seeded, dehiscent.....3. Spiraea.
        - Stamens scarcely exserted; flowers creamy-white; pods 1-seeded, tardily dehiscent or indehiscent.....4. Holodiscus.

Leaves compound, the leaflets minute.....5. CHAMAEBATIARIA.
Stamens united at base; leaves dissected; decumbent shrub.....6. LUETKEA.
Flowers dioecious; tall herb.....7. ARUNCUS.

2. FRUIT INDEHISCENT; SHRUBS OR HERBS.

a. Ovary becoming an achene (or drupelet in no. 8.)—TRIBE ROSEAE.

Pistils more than 1, commonly many to numerous; achenes more than 1; leaves compound or pinnately lobed.
Pistils becoming drupelets which are coherent on a convex receptacle and form a fruit called a "berry"; leaves compound or simple; shrubs or bushes...8. RUBUS.
Pistils becoming dry achenes.
Pistils borne on a flat or convex receptacle.
Calyx lobes with 5 alternate bractlets (rarely absent in no. 11).
Style deciduous from the achene; receptacle conic; herbs (except one species in no. 10).
Receptacle fleshy; leaves 3-foliolate.....9. FRAGARIA.
Receptacle dry; leaves pinnate or palmate, the leaflets rarely 3...10. POTENTILLA.
Style persistent on the achene.
Leaves pinnate; receptacle conic or hemispheric; achenes and styles strongly deflexed; herbs.....11. GEUM.
Leaves pinnately lobed; receptacle flat; achenes and styles not deflexed; shrubs.....12. FALLUGIA.
Calyx-lobes without bractlets; achene with a long feathery tail.13. COWANIA.
Pistils disposed on the inside of a globose or urn-shaped calyx-tube which is lined by a thin disk or receptacle, in fruit termed a "hip"; leaves pinnate; stems prickly.....14. ROSA.
Pistil only one.
Leaves compound.
Low bush; leaflets numerous, minute.....15. CHAMAEBATIA.
Herbs.
Leaves pinnate.
Calyx prickly; perennials.
Petals yellow; prickles of calyx hooked at tip.....16. AGRIMONIA.
Petals none; prickles of calyx straight but retrorsely barbed.....17. ACAENA.
Calyx not prickly; petals none; annuals or perennials.18. SANGUISORBA.
Leaves palmately divided; petals none; diminutive annuals.....19. ALCHEMILLA.
Leaves simple; shrubs.
Achene with long feathery tail; petals none.....20. CERCOCARPUS.
Achene not tailed; leaves small, mostly fascicled.
Leaves entire, narrow.
Petals white; leaves needle-like; branches not spinescent.....21. ADENOSTOMA.
Petals none; leaves narrowly oblanceolate; branches spinescent.....22. COLEOGYNE.
Leaves cuneate, 3-toothed or -lobed above; petals pale yellow...23. PURSHIA.

b. Ovary becoming a drupe; trees or shrubs with simple leaves and caducous stipules.—TRIBE DRUPEAE.

Pistils 5; drupes 1 to 5; flowers dioecious.....24. OSMARONIA.
Pistil 1; drupe solitary; flowers perfect.....25. PRUNUS.

B. Ovary inferior, 2 to 5-celled, enclosed in and mostly adherent to the fleshy calyx-tube; fruit a pome; trees and shrubs.—Tribe POMEAE.

Leaves compound; flowers in compound corymbs; fruit coral red, berry-like...26. SORBUS.
Leaves simple.
Foliage evergreen, coriaceous; flowers small, numerous, in a corymbose panicle; fruit bright red, berry-like.....27. PHOTINIA.
Foliage deciduous.
Flowers in corymbs
Branches not thorny; styles united at base; fruit a pome.....28. PYRUS.
Branches with stout thorns; styles distinct; fruit drupe-like, containing 2 to 5 bony stones.....29. CRATAEGUS.
Flowers not in corymbs; branches not thorny; fruit berry-like containing several cartilaginous seeds.
Flowers 1 to 3 in a sessile umbel; petals spreading; styles 2.....30. PERAPHYLLUM.
Flowers several in a raceme; petals erect; styles 5.....31. AMELANCHIER.

1. **LYONOTHÁMNUS** Gray

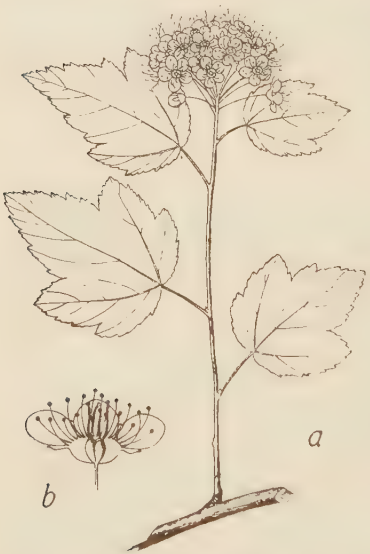
Evergreen tree with thin bark exfoliating in long loose strips and opposite dimorphic petioled leaves. Flowers numerous in a much-branched terminal panicle. Petals 5 and stamens 13 to 16, inserted on the margin of the woolly disk lining the hemispheric 5-lobed calyx-tube. Pistils 2, distinct, each with a spreading style and capitate stigma. Fruit consisting of two

woody 4-seeded carpels dehiscent ventrally and partly dehiscent dorsally. (The sur-name of W. S. Lyon of Los Angeles, the discoverer, combined with Greek thamnos, shrub.)

1. **L. floribúndus** Gray. CATALINA IRONWOOD. Slender tree 20 to 55 ft. high, with narrow crown; leaves Oleander-like, linear, nearly entire or pinnately cut, petioled, 3 to 5 in. long, or often pinnately compound with 2 to 5 leaflets similar in shape and size to the simple leaves; flowers white, 3 lines broad, in terminal clusters 3 to 6 in. broad; petals orbicular, sessile, white, crenulate-edged.—Insular species, confined to Santa Catalina, San Clemente, Santa Rosa and Santa Cruz Isls.

2. PHYSOCÁRPUS Maxim. NINE-BARK

Deciduous shrubs with reddish brown shreddy bark. Leaves simple; stipules deciduous. Flowers white, in corymbs terminating lateral leafy branchlets. Calyx campanulate, 5-cleft. Petals rounded, equal. Stamens 20 to 24. Pistils 1 to 5, mostly 3, somewhat united toward the base, becoming as many inflated 2 to 4-seeded pods dehiscent along both sutures. Seeds with copious endosperm. (Greek phusa, bellows or bladder, and karpos, fruit.)



472. Physocarpus capitatus Ktze.; *a*, fl. branchlet x ½; *b*, long. sect. fl. x 2.

1. **P. capitàtus** (Pursh) Ktze. NINE-BARK. Fig. 472. Erect or straggly shrub 3 to 5 ft. high; leaves roundish or ovate, 3-lobed and irregularly serrate, glabrous, or stellate-pubescent beneath, 1 to 3 in. long, on petioles ½ to 1½ in. long; leaves of sterile shoots similar but larger; corymbs hemispherical, ¾ to 1 in. high; petals 1½ to 2 lines long; pods divergent, commonly 3 to 4 lines long.—Common along streams in the hills, or often gregarious on steep north slopes, 500 to 4500 ft.: Santa Cruz Mts. to Humboldt Co. and Mt. Shasta, thence s. at scattered stations in the Sierra Nevada; n. to B. C.

3. SPIRÀEA L. SPIRAEA

Shrubs with simple deciduous leaves, short petioles and no stipules. Flowers white or rose-colored, small (about ¾ to 1½ lines long), numerous, crowded, in terminal corymbs, panicles or spikes. Stamens 10 to 50, much-exserted. Pods commonly 5, not inflated, few- to several-seeded. (Greek speira, a band, wreath.)

Erect shrubs; leaves not in rosettes.
Flowers rose-pink, in narrow panicles; leaves white-tomentose beneath. . 1. *S. douglasii.*
Flowers pale purple, in corymbs; leaves glabrous. . . . . 2. *S. densiflora.*
Prostrate shrubs, somewhat herb-like, with leaves in close dense rosettes; flowers white, in dense cylindrical spikes. . . . . 3. *S. caespitosa.*

1. **S. douglásii** Hook. Erect, 2 to 6 ft. high, with stoutish branches and reddish brown bark; leaves oblong, serrate at apex, green above, white-tomentose beneath, 1 to 3 (or in shade even 4) in. long; panicles narrow, usually elongated, 2 to 5 in. long; calyx-lobes mostly reflexed; petals ovate.—N. Cal. mts., about 5000 ft.: Plumas Co. to Modoc Co., w. to seashore at Humboldt Co., thence n. to B. C.

2. **S. densiflòra** Nutt. Fig. 473. Erect, 1 to 3 ft. high with reddish bark; leaves elliptic to ovate, sharply and often unequally serrate, but entire towards the rounded base, ⅝ to 1 (or 2½) in. long; corymbs terminal, roundish, ¾ to 2 in. broad; calyx-lobes erect; petals roundish obovate.—

High mts., often in clefts of granite rocks, 6000 to 9000 ft.: Sierra Nevada from Tulare Co. to Lassen Peak, thence w. to Mt. Shasta and Salmon Mts.; n. to B. C. July. (S. betulaefolia Bot. Cal.)

3. **S. caespitòsa** Nutt. Stems prostrate, woody, densely clothed with rosulate tufts of leaves and forming matted plants ½ to 3 ft. broad; flowering stems ascending, scape-like, with few small leafy bracts, 3 to 4 in. high; leaves oblong-obovate, entire, acute, densely silky, 2 to 3 lines long; spikes ¾ to 2 in. long; petals narrow-obovate.—Limestone rocks, desert ranges, 4000 to 7000 ft.: Providence Mts.; Panamint Mts.; s. Sierra Nevada; e. to Rocky Mts., n. to southern Ore. May. (Petrophytum acuminatum Rydb.)

473. Spiraea densiflora Nutt.; fl. branchlet x 1.

4. HOLODÍSCUS Maxim.

Deciduous shrubs with toothed or lobed leaves and no stipules. Flowers creamy-white, small, numerous in terminal panicles. Petals 5, rounded. Stamens 20, on a ring-like perigynous disk. Pistils 5, distinct. Pods hairy, 1-seeded, tardily dehiscent or indehiscent. (Greek holo, whole, and diskos, a disk, some related genera with lobed disks.)

1. **H. discòlor** (Pursh) Maxim. CREAM BUSH. Fig. 474. Shrub 3 to 6 ft. high; leaves ovate to ovate-elliptic in outline, green above, whitish beneath with soft hairs, coarsely serrate or incised above the entire broadly cuneate (or sometimes subtruncatish) base, ¾ to 3 in. long, on petioles 2 to 6 lines long; panicle ample, 3 to 8 in. long, often half drooping in anthesis; flowers 1½ lines long; follicles about 1 line long. — Cañons in the hills, 5 to 4000 ft., from Los Angeles through the Coast Ranges to Siskiyou Co.; occasional in the Sierra Nevada, 3500 to 6600 ft.; n. to B. C. June. Var. DUMÒSUS Dippel. Lower, more compact; leaves 3 to 7 lines long; panicle narrow, less diffuse.—Rocky places, high montane, 6000 to 9000 ft.: mts. of S. Cal.; Panamint Range; Sierra Nevada; Yollo Bolly Mts. July. Var. GLABRÉSCENS Hel. Diffuse, 2 to 4 ft. high; leaves sparingly pubescent and glandular-dotted, especially beneath.—Mt. Shasta; n. to Ore., e. to Utah.

474. Holodiscus discolor Maxim.; *a*, fl. branchlet x ½; *b*, fl. x 3; *c*, fr. x 7½.

5. CHAMAEBATIÀRIA Maxim.

Glandular pubescent and aromatic deciduous shrub. Leaves twice pinnate with numerous minute leaflets. Stipules entire. Flowers large, white, in a terminal racemose panicle. Stamens about 30 to 50, included. Pods 5, coriaceous, several-seeded, dehiscent down the ventral suture and half way down the back. (Resembles Chamaebatia.)

475. Chamaebatiaria millefolium Maxim.; fl. branchlet x 1.

1. **C. millefòlium** (Torr.) Maxim. DESERT-SWEET. Fig. 475. Stout, erect, branching, 2½ to 6 ft. high; axis of inflorescence and pedicels heavily glandular, the foliage less glandular, sparingly soft-pubescent; leaves oblong-lanceolate in outline, 1 to 1¾ in. long; flowers 4 to 6 lines broad; petals orbicular.—Desert slopes, 5500 to 9500 ft.: e. side Sierra Nevada from Inyo Co. to Shasta and Modoc Cos.; Panamint Range; White Mts.; n. to southern Ore., e. to Wyo. and Ariz. Herbage very fragrant.

6. **LUÈTKEA** Bong.

Low, herb-like plant, the woody stems decumbent or creeping, the flowering stems erect, ending in a raceme. Leaves biternately parted into linear lobes. Stamens about 20; filaments united at base. Pistils 5 (or 4 or 6). Pods coriaceous, 2-valved. (Count F. P. Luètke, 1797–1882, commander of a Russian exploring expedition in the arctic.)

1. **L. pectinàta** (Pursh) Ktze. Flowering stems 4 to 5 in. high; leaves 5 to 7 lines long, including the broad petiole; flowers white, 3 to 3½ lines broad.—High slopes near perpetual snow: Siskiyou Co. (Mt. Shasta; above Cold Spr., West Fork Woolly Creek); n. to Alas.

7. **ARÚNCUS** L. GOAT'S BEARD

Tall perennial herbs. Leaves two or three times pinnate, without stipules. Flowers white, dioecious, borne in long slender spikes, the spikes disposed in a large compound panicle. Follicles usually 3, at length reflexed, commonly 2-seeded. (Latin aruncus, the beard of a goat, says Pliny.)

1. **A. sylvéster** Kost. GOAT'S BEARD. Erect, 2 to 3 ft. high, glabrous; leaflets thin, ovate or oblong-lanceolate, irregularly serrate, acuminate, 1½ to 5 in. long; flowers 1 line broad; petals obovate; stamens much exserted. — Along streams in cañons: Shasta, Trinity, n. Humboldt and Del Norte Cos.; n. to Alas., e. to Alleghanies; Eur., Asia.

8. **RÙBUS** L.

Ours bushes, prickly or unarmed, the stems erect, or long and trailing or climbing. Leaves simple, or pinnately compound

476. Rubus parviflorus Nutt.; *a*, fl. branchlet x ¼; *b*, fr. x ½.

with 3 to 5 leaflets. Calyx 5-parted, without bractlets. Petals 5. Stamens numerous. Pistils many, crowded on an elevated receptacle, becoming drupelets which are united to each other and form the aggregate fruit called a **blackberry or raspberry.** (Latin name, allied to ruber, red.)

Fruit conical or hemispherical, concave beneath, the drupelets parting from the receptacle as a whole when ripe.
Stems unarmed; leaves simple, palmately lobed.....1. *R. parviflorus.*
Stems prickly; leaves 3-foliolate.
Flowers red; leaves pubescent or silky beneath.....2. *R. spectabilis.*
Flowers white; leaves white-tomentose beneath.....3. *R. leucodermis.*
Fruit oblong, the drupelets persistent upon the receptacle; leaves mostly 3 to 5-foliolate, a few simple; stems and leaves very prickly.....4. *R. vitifolius.*

1. **R. parviflòrus** Nutt. THIMBLE-BERRY. Fig. 476. Stems erect, 3 to 6 ft. high; bark eventually shreddy; leaves deciduous, circular in outline, palmately 5-lobed, cordate at base, unequally serrate, 3 to 7 in. broad, puberulent to almost glabrous, the petioles and stems hispidulose and more or less glandular; flowers about 4 to 7 in terminal corymbs, white (rarely pinkish), 1 to 2 in. broad; calyx-lobes 5, sometimes 6 or 7, ovate, terminated by a tail-like or sometimes foliaceous appendage; petals of the same number as the calyx-lobes, elliptic; berry scarlet, 6 to 8 lines broad.—Common along cañon streams and in open woods: mts. of S. Cal. and Sierra Nevada, 3000 to 7000 ft.; hill country near the coast, 50 to 2000 ft. (Santa Lucia Mts. to Del Norte Co., leaves often velvety pubescent beneath=var. velutinus Greene); n. to Alas., e. to Mich. and N. Mex.

2. **R. spectábilis** Pursh. SALMON-BERRY. Stems erect, 3 to 9 ft. high, with reddish brown bark and sparingly armed, or the canes (sterile shoots) very prickly; prickles short, straight; leaves 3-foliolate, deciduous; leaflets ovate, doubly serrate, often more or less lobed, 1 to 3½ in. long; flowers 1 to 3 in a cluster, 1 to 1¾ in. broad; petals red; berry ovoid, red or yellow, glabrous, 7 to 9 lines broad.—Margins of woods and along streams, vicinity of the ocean: Mendocino Co. to Humboldt Co.; n. to Alas. Var. MENZIÈSII Wats. Leaves more or less silky-pubescent beneath.—Santa Cruz Mts.; San Francisco; Tomales Bay. Passing into the usual form northward. Apr.

3. **R. leucodérmis** Dougl. WESTERN RASPBERRY. Stems in the first year vigorous and erect (''canes''), bearing 5 to 7-foliolate leaves, in the second year bearing short leafy flowering branchlets with 3-foliolate leaves and bending over and becoming straggling; stems and petioles armed with prickles; herbage glaucous; leaves partly persistent through winter, the leaflets round-ovate to ovate-lanceolate, often unequal-sided at base, doubly serrate, ¾ to 3½ in. long, pubescent but green above, white with a dense close tomentum below; stipules setaceous; flowers few, corymbose, white, 6 to 8 lines broad; sepals lanceolate, long-acuminate, exceeding the petals; berry glaucous, 6 lines broad, of an agreeable flavor, either black or red. — Cañon bottoms or hill slopes: San Gabriel and San Bernardino mountains and Sierra Nevada, 2500 to 7000 ft.; near the coast from the Santa Cruz Mts. to Humboldt Co.; n. to B. C., e. to Wyo. Apr.

477. Rubus vitifolius C. & S.; *a*, compound leaf x ⅓; *b*, simple leaf x ⅓; *c*, fl. with stamens x 1; *d*, fl. with pistils x 1.

4. **R. vitifòlius** C. & S. California Blackberry. Fig. 477. Evergreen bush; stems a few ft. high and more or less erect, or several to 18 ft. long and trailing over the ground or climbing over other shrubs; prickles very slender and straight, or more commonly rather short, recurved and thickened at base; leaves pubescent or almost glabrous, pinnately 3 to 5-foliolate, the leaflets ovate, doubly serrate, ¾ to 3¼ in. long, or sometimes a few upper leaves simple and ovate or palmately lobed; flowers ¾ to 1¼ in. broad; petals 5 to 9 lines long; berry black, oblong, sweet.—Valleys and hills at low altitudes, chiefly along streams or in springy flats, very common: Coast Ranges, Great Valley, Sierra Nevada foothills and S. Cal. Apr.-May.

R. laciniàtus Willd. Common Blackberry. Plants 4 to 8 ft. high; evergreen; leaflets 5 to 15, laciniate-toothed; flowers white or pale pink, in panicles; berry black.—Occasionally escaped from cult.: Tuolumne Co. Also Curry Co., sw. Ore.

9. FRAGÀRIA L. Strawberry

Perennial herbs, the leaves and flowers in a basal tuft, giving off prostrate stems or runners. Leaves 3-foliolate, with membranous stipules and cuneate-obovate serrate leaflets. Flowers white, borne in cymes on a naked scape. Calyx persistent, bearing 5 bractlets alternate with the calyx-lobes. Petals obovate, short-clawed. Stamens about 20. Pistils numerous, distinct, borne on an elevated convex receptacle; styles lateral. Fruit berry-like, formed of the enlarged succulent receptacle which bears the minute seed-like achenes. (Name in reference to the fragrance of the berry.)

Leaves very thick and leathery, with evident reticulate veinlets; flowers very large, ¾ to 1½ in. broad; sea-shore ..... 1. *F. chilensis.*
Leaves rather thin, occasionally rather thick, but never with evident reticulate veining; flowers smaller, ½ to 1 in. broad.
  Achenes in deep pits in the receptacle; at least the terminal leaflet usually short-petiolate; inflorescence subumbellate, rather compact and usually shorter than the leaves; Sierra Nevada and n. Cal., above 5000 ft. ..... 2. *F. virginiana.*
  Achenes superficial or in shallow pits; leaflets subsessile; inflorescence usually irregularly branched and becoming elongate; throughout the state, 100 to 6600 ft.. 3. *F. californica.*

478. Fragaria chilensis Duch.; habit x ¾.

1. **F. chilénsis** (L.) Duch. Sand Strawberry. Fig. 478. Scapes several-flowered, 1 to 4 (or 8) in. high; upper surface of leaves dark green, glabrous, the herbage otherwise densely hairy; leaflets ½ to 1 in. long; calyx-lobes entire; petals roundish; receptacle with the achenes embedded in its surface; fruit 7 to 10 lines in diameter.—Sand-dunes, bluffs and beaches along the coast: San Luis Obispo to Humboldt Co.; n. to Alas.; Chile.

2. **F. virginiána** Duch. var. **platypétala** Hall. Scarlet Strawberry. Scape 2 to 5 in. high, bearing a usually close umbellate cluster much shorter than the leaves; leaflets obovate or oblong, green, glabrous and glaucous above, below pale and sparsely pubescent, 1 to 2

in. long; petioles with spreading hairs; flowers 7 to 12 lines broad; achenes set in deep pits; fruit 5 to 7 lines broad.—Mts., 4000 to 8000 ft.: Sierra Nevada and mts. of n. Cal. Var. SIBBALDIFÒLIA Jepson n. comb. Leaflets small (5 to 10 lines long), the apices subtruncate, 3 to 7-toothed.—High mts., 8000 to 10,000 ft.: Mt. Dana s. to Olancha Peak. (F. sibbaldifolia Rydb.)

3. **F. californica** C. & S. WOOD STRAWBERRY. Scapes 4 to 5 in. (rarely 10) high, cymosely 2-flowered; scapes and petioles pilose, the hairs ascending or spreading; leaflets thin, light green, 1 to 1¼ in. long; flowers 5 to 11 lines broad; fruit globose, about 4 to 5 lines broad, the achenes borne superficially. —Openly wooded hills: Coast Ranges, Santa Cruz Co. to Humboldt Co., mostly 50 to 2000 ft.; Santa Rosa Mts. to San Bernardino Mts., 4500 to 6600 ft.; Sierra Nevada from Tulare Co. to Mt. Shasta and w. to Marble Mt., 3500 to 6000 ft. (mostly var. CRINÌTA Hall, stems and petioles densely pilose with spreading hairs). Var. FRANCISCÀNA Rydb. Leaves thicker and more strongly veined.—Exposed habitats about San Francisco Bay.

10. **POTENTÍLLA** L. FIVE FINGER

Perennial herbs (rarely annuals or shrubs). Leaves compound, typically with serrate or cleft leaflets. Flowers white, yellow (or purple in one), in terminal cymes, rarely solitary, the cymes sometimes capitate. Calyx saucer-shaped, campanulate, or cup-shaped, cleft into 5 lobes, with as many alternate bractlets at the sinuses. Petals orbicular to linear. Stamens 5 to many, the filaments filiform or dilated. Pistils few to numerous, borne upon an elevated receptacle, becoming in fruit small turgid crustaceous achenes; styles lateral or nearly terminal, deciduous. (Diminutive of the Latin potens, powerful, some species used medicinally.)

A. Style lateral; ovules ascending; filaments filiform; perennials.

Stamens 5; petals minute; leaves 3-foliolate; achenes 10 to 15.—Subgenus SIBBALDIA.... 1. *P. procumbens.*

Stamens about 20 to 25; leaves pinnate.
- Herbs; achenes glabrous.
  - Petals yellow; stems wholly creeping, rooting at the joints; leaves white-silky beneath.—Subgenus ARGENTINA.....2. *P. anserina.*
  - Petals dark-purple; stems ascending, rooting below.—Subgenus COMARUM..... 3. *P. palustris.*
- Low shrubs; petals yellow; achenes hairy.—Subgenus DASIPHORA....4. *P. fruticosa.*

B. Style terminal or nearly so; ovules pendulous.

I. STAMENS 15 TO 25 (10 IN NOS. 5 TO 7), INSERTED ON A DISK OR ANNULAR THICKENING NEAR THE RECEPTACLE; FLOWERS YELLOW (RARELY WHITISH OR CREAM-COLOR, IN NOS. 9 AND 13); CALYX-TUBE SAUCER-SHAPED; ACHENES NUMEROUS.—Subgenus EUPOTENTILLA.

1. Inflorescence leafy; leaves with 3 or 5 (or 7 or 9) leaflets.

Stamens about 10; annual or biennial.
- Leaves all ternate.
  - Leaflets oblong-cuneate.....5. *P. millegrana.*
  - Leaflets broadly obovate.....6. *P. biennis.*
- Leaves with 5 leaflets; stamens 10.....7. *P. rivalis.*

Stamens 25 to 30; basal leaves pinnate with 3 or 5 (or 7 or 9) leaflets; perennial..... 8. *P. saxosa.*

2. Inflorescence with few leaves or merely bracteate; flowers yellow (rarely whitish or cream-color in nos. 9 and 13); perennial herbs, the stems from a more or less branched root-crown or short caudex.

a. Leaves pinnate, with 5 or more leaflets.

Leaflets ovate, merely toothed, not deeply incised; herbage glandular-pubescent..... 9. *P. glandulosa.*

Leaflets deeply incised or cleft into linear or oblong lobes.
- Leaflets rather regularly cleft or incised along the sides (pinnatifid).
  - Stems erect or ascending; herbage grayish; leaflets with narrowly revolute margins; petals erect; White Mts.....10. *P. pennsylvanica.*
  - Stems ascending; herbage green; no revolute margins to leaflets; petals rotate; high mts., rare.....11. *P. drummondii.*
- Leaflets cleft, incised or divided from the apex (palmatifid or tending to be so, at least in part), no revolute margins.
  - Herbage silvery; stems horizontally spreading or diffuse; alpine or subalpine, common.....12. *P. breweri.*
  - Herbage green or greenish; stems prostrate or decumbent or diffuse.

Petioles ⅓ to ½ as long as blade; leaflets cleft ½ to ¾ the way to base; central coast.....13. *P. hickmanii.*
Petioles very short (1/10 to ⅛ as long as blade); leaflets cleft nearly to base; ne. interior plateau.....14. *P. plattensis.*

b. Leaves palmate with 3 to 7 leaflets (all from summit of petiole); mostly montane and high-montane.

Leaflets oblanceolate to obovate.
Stems decumbent; leaves with 3 to 5 leaflets, densely silky-villous.
Plant decumbent; stems leafy; leaflets toothed at summit; high mts. of S. Cal. and Tulare Co.....15. *P. wheeleri.*
Plant caespitose; stems sparingly leafy; leaflets deeply cleft into linear segments; alpine, desert ranges.
Leaves densely white-silky.....16. *P. pseudosericea.*
Leaves green above, whitish beneath.....17. *P. rubricaulis.*
Stems erect or ascending; leaves with 5 to 7 leaflets.
Leaves green on both sides, but sparingly silky-villous, the basal with petioles 1 to 3 in. long; subalpine.....18. *P. dissecta.*
Leaves commonly whitish or silky-gray beneath, commonly 1 to 3 in. long, the basal with petioles 3 to 9 in. long; montane at middle altitudes.
Leaflets divided nearly to midrib into narrowly linear segments with felt-like tomentum beneath.....19. *P. flabelliformis.*
Leaflets serrate or pinnatifid-serrate; villous or silky beneath or subglabrous. 20. *P. gracilis.*
Leaflets broadly obovate; leaves with 3 leaflets.....21. *P. flabellifolia.*

II. STAMENS 5 TO 20, INSERTED ON THE MARGINS OR WELL UP ON THE CALYX-TUBE; NO ANNULAR DISK; LEAVES ALWAYS PINNATE; STEMS FROM A MORE OR LESS BRANCHED ROOT-CROWN OR SHORT CAUDEX; PERENNIAL HERBS.

1. Filaments filiform (except nos. 25 and 26); petals white or yellow; stamens 5 to 20; pistils 3 to 15 (or 20 to 25); leaflets many to numerous, usually crowded or imbricated, 1 to 3 (or 4) lines long, commonly palmately cleft or divided into 2 to 4 (or 5) segments.—Subgenus IVESIA.

Stamens 15 to 20.
Petals with slender claws nearly as long as the blade; segments of leaflets linear to oblanceolate or oblong, acute or obtuse; Sierra Nevada.
Herbage villous but green or greenish.
Cauline leaves few; petals yellow.....22. *P. campestris.*
Cauline leaves several; petals white.....23. *P. unguiculata.*
Herbage white silky-villous; petals white or yellowish; cauline leaves many..... 24. *P. pickeringii.*
Petals not clawed; leaflets oval to oblong-elliptic.
Filaments dilated.
Cyme few-flowered; herbage greenish or grayish; calyx purplish; high s. Sierra Nevada.....25. *P. purpurascens.*
Cyme many-flowered, composed of subcapitate clusters; herbage silvery-villous; calyx green; San Bernardino Mts.....26. *P. argyrocoma.*
Filaments filiform; cyme open or diffuse; high montane.
Leaflets minute, so densely crowded that the silvery leaf is terete or worm-like; anthers opening by a pore; high montane..... 27. *P. santolinoides.*
Leaflets less crowded, greenish; anthers opening by a slit; Mt. San Jacinto; var. callida of.....28. *P. shockleyi.*
Stamens 5 (10 in 2 vars. of no. 29); high montane.
Cyme open, more or less distinctly racemose; petals white, shorter than the calyx-lobes.....28. *P. shockleyi.*
Cyme compact or dense or even capitate.
Petals exceeding the sepals before anthesis; herbage green, viscid-puberulent to subglabrate; leaflets crowded; petals yellow, commonly as broad or broader than long; common, Sierra Nevada.....29. *P. gordonii.*
Petals minute, never equaling the sepals; rare, Sierra Nevada.
Leaves silvery, terete; petioles about ¼ or ⅓ as long as blade.30. *P. muirii.*
Leaves green, flat, loosely villous; petioles about as long or a little longer than blade.....31. *P. webberi.*

2. Filaments dilated, at least the alternate; stamens 10, alternately long and short; pistils numerous or often only 2 to 15; flowers white (pinkish white in no. 36).—Subgenus HORKELIA.

Leaflets parted or divided into 3 to 5 linear or oblong segments or divisions, mostly 1 to 3 (or 4) lines long, usually many or numerous, often crowded.
Stipules entire; pistils about 15.
Cyme dense; central coast.....32. *P. tenuiloba.*
Cyme lax; White Mts.....33. *P. hispidula.*
Stipules more or less divided or cleft.
Cyme congested or dense; pistils 8 to 12; leaves villous; Siskiyou region..... 34. *P. daucifolia.*
Cyme very open and lax; pistils 2 to 5.
Leaves greenish; stipules twice or thrice dichotomously divided; Humboldt Co.....35. *P. laxiflora.*
Leaves silky; stipules 2-cleft; Del Norte Co.....36. *P. howellii.*

Leaflets merely toothed (dissected in no. 39, sometimes in no. 37), mostly ½ to 1 or 2 in. long, usually not crowded.
Flowers on slender drooping or recurved pedicels.....37. *P. parryi.*
Flowers not on recurved pedicels.
Petals erect or nearly so; cyme dichotomously forked; calyx-tube deeply cup-shaped; filaments opposite the petals filiform or at least less dilated than the others.
Bractlets usually 3-toothed; stems stout; leaves not thin...38. *P. californica.*
Bractlets usually entire; stems slender; leaves thin, dissected...39. *P. elata.*
Petals spreading rotately; bractlets entire; filaments all dilated, though unequally so; calyx-tube saucer-shaped or cupulate.
Leaflets 11 to 29.
Petals truncate or retuse at apex; herbage greenish, more or less pubescent and glandular; Sierra Nevada....40. *P. douglasii.*
Petals rounded or obtuse or subacute at apex.
Dry interior ranges; herbage hoary or silky-pubescent, not glandular.....41. *P. bolanderi.*
Coastal or seashore; herbage usually more or less glandular.
Herbage greenish, pubescent.....42. *P. lindleyi.*
Herbage white-silky with short hairs.....43. *P. kelloggii.*
Leaflets 5 to 9, cuneate, commonly 3-toothed at apex; petals acute at base and apex; herbage white-silky; Sierra Nevada....44. *P. congesta.*

1. **P. procúmbens** (L.) Clairv. Low matted plant, the stems 2 to 6 in. high; leaves ternate on petioles ½ to 2 in. long; leaflets broadly cuneate, toothed at apex, sparsely soft-hairy, ¼ to ¾ in. long; cymes commonly few-flowered, compact at first, becoming open in fruit; flowers 2 to 2½ lines broad; petals yellow, ovate or elliptic, shorter than the sepals; stamens 5 (or 6); achenes 5 to 20.—High montane, 8000 to 11,800 ft.: San Bernardino Mts.; Sierra Nevada from Tulare Co. to Siskiyou Co.; n. to Alas., e. to N. Eng.; n. Eur. and Asia.

2. **P. anserina** L. SILVER-WEED. Fig. 479. Leaves and peduncles in a basal tuft on a fascicle of roots, producing slender runners, these rooting at each joint; leaves white-silky beneath, dark green above and glabrous or nearly so; leaflets 13 to 21, with smaller ones interposed, oblong, sharply serrate, ½ to 1½ in. long; flowers solitary on long peduncles, ¾ to 1¼ in. broad; petals rounded, much exceeding the calyx-lobes; stamens 20 to 25; receptacle hairy.—Marshy or springy places: along the coast, 10 to 100 ft., from Los Angeles Co. to Del Norte Co.; n. to arctic Am., e. to N. Eng.; Eur., Asia. Var. ARGÉNTEA Jepson n. comb. Leaves silky and usually silvery on both sides. — Arid interior: San Bernardino Mts.; e. of Sierra Nevada from Mono Co. to Siskiyou Co.; n. to Brit. Am. (Argentina argentea Rydb.)

479. Potentilla anserina L.; *a*, habit x ⅓; *b*, long. sect. of fl. x 1; *c*, stamen x 2.

3. **P. palústris** Scop. MARSH POTENTILLA. COWBERRY. Stems stout, ascending, often rooting at the decumbent base, glabrous below, puberulent above, with long creeping rootstock; leaves pinnate with long stipules; leaflets 5 to 7, oblong, 1 to 1¾ in. long, mostly glabrous except along the veins and margins; flowers 1 to 2 in. broad, few to several in an open cyme; calyx spreading, pubescent, purplish-green below, dark reddish-purple above; calyx-lobes ¼ to ½ in. long, or becoming 1 in. long; petals very dark purple, ovate-lanceolate, 2 lines long; stamens 20 to 23, on a glandular ring; filaments

480. Potentilla fruticosa L.; fl. branchlet x 1.

rather stout, filiform, broader at base; receptacle becoming enlarged and spongy in fruit; achenes numerous, glabrous.—Cold bogs, often aquatic: n. Cal. (Del Norte, Shasta, Sierra, and Modoc Cos.); n. to Alas., e. to Lab.; Eur., Asia. Var. VILLÒSA Lehm. Leaves densely appressed silky-villous below.—Del Norte Co.

4. **P. fruticòsa** L. SHRUBBY CINQUEFOIL. Fig. 480. Much branched shrub 1 to 4 ft. high; branchlets densely leafy, when young silky-hairy, in age with brownish shreddy bark; leaves pinnate with crowded leaflets, 4 to 7 lines broad, ½ to ¾ in. long, on petioles 1 to 2 lines long, white silky-pubescent beneath; leaflets 3 to 7, oblong, entire, 2 to 5 lines long; flowers ½ to 1 in. broad; petals yellow, orbicular; stamens about 25.—At or about timberline, 8000 to 12,000 ft.: Sierra Nevada from Madera Co. to Lassen Co.; n. to sub-arctic regions, N. Am., Eur., Asia.

5. **P. millegràna** Engelm. Stems slender, prostrate, spreading to erect, freely branched from the base upward, ½ to 1½ ft. high; herbage pubescent; leaves all ternate; leaflets cuneate-obovate, serrate-incised at apex (or above the middle), ½ to 1 in. long; flowers 1½ to 2 lines broad; petals light yellow, shorter than the calyx-lobes; stamens about 10; mature achenes smooth, pale.—Bottom lands: Estrella; Tracy; Sonoma Co.; Truckee; n. to Wash., e. to N. Mex. and Ill.

6. **P. biénnis** Greene. Stems strictly erect, branched from the base or the middle, ¾ to 2 ft. high, more or less purplish, leafy; herbage thinly pubescent and minutely glandular; leaves all ternate; leaflets broadly obovate, coarsely crenate, 6 to 11 lines long; cyme not spreading, its branches elongated and the flowers in scattered clusters or solitary in the axils of the small leaves in such a way as to appear racemose; flowers small (3 lines broad), on pedicels 2 to 4 lines long; petals yellow (or white); stamens 10; mature achenes whitish.—Moist bottom lands in ranges bordering the deserts on the west, 5000 to 8200 ft.: San Bernardino Mts., Mt. Pinos, e. to the Panamint Mts. and n. along the Sierra Nevada (chiefly east slope) to Modoc Co.; n. to Saskat.

7. **P. rivàlis** Nutt. Stems coarse, erect or ascending, 1 to 2 ft. high; herbage soft-pubescent; lower leaves with 5 leaflets or the upper ternate; leaflets oblong or obovate, usually twice as long as broad, incised-serrate or crenate, 1 to 1½ in. long; cyme widely branched, open, leafy; flowers about 2½ lines broad; petals yellow, much exceeded by the bractlets; stamens about 10; ripe achenes smooth, pale. Bottom lands, lower Sacramento and San Joaquin rivers.

8. **P. saxòsa** Lem. Stems slender, ascending, 4 to 7 in. high, these and the leaves tufted; herbage glandular-pubescent; leaves pinnate; leaflets 3 to 7 (or 9), broadly ovate, or fan-shaped, crenate to deeply serrate, 3 to 6 lines long; cymes loose, few-flowered, somewhat leafy; flowers small and inconspicuous (2½ to 3 lines broad), on filiform pedicels 4 to 9 lines long; bractlets ovate-acute to lanceolate, sometimes 2-cleft; petals ovate-acuminate, white or light yellow; stamens 25 to 30; achenes 8 to 10.—Rock crevices, ranges in or bordering the deserts: White Mts.; Twenty-nine Palms; Mt. San Jacinto; s. to L. Cal. (P. rosulata Rydb. P. acuminata Hall.)

9. **P. glandulòsa** Lindl. Fig. 481. Stems erect, often reddish, 1 to 4 ft. high; herbage pubescent, the stems and petioles glandular; basal leaves 4 to 8 or even 15 in. long; leaflets 5 to 7 (or 9), or those of the uppermost leaves 3, roundish ovate, or obovate with cuneate base, 1 to 3 in. long; cyme lax, leafy-bracted; flowers 4 to 7 lines broad; petals pale yellow (or sometimes pale cream), obovate, rounded at apex, or orbicular, scarcely equaling the calyx; stamens 25; achenes glabrous.—Wooded hills or mt. slopes: coastal

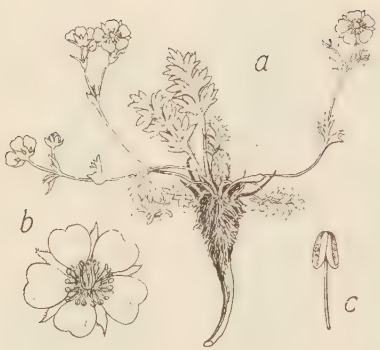
S. Cal., 500 to 4000 ft.; Coast Ranges, 100 to 4000 ft., mostly near the coast: Sierra Nevada, 2000 to 6000 ft.; n. to Siskiyou and Modoc Cos.; far n. to B. C., e. to S. Dak. and N. Mex. Var. WRANGELLIÀNA Wolf. Stems very rank, usually very glandular, much and widely branched, 3 to 4 ft. high; basal leaves 1 ft. long including the petiole.—Wooded slopes near the coast. Var. NEVADÉNSIS Wats. Stems not reddish; herbage often less glandular; inflorescence more nearly naked; leaflets usually smaller; petals elliptic.—Montane, 5000 to 11,000 ft., high North Coast Ranges; Sierra Nevada from Shasta Co. to Tulare Co., thence w. to Mt. Pinos and s. to Palomar Mt. Var. LÁCTEA Greene. Plants 5 to 18 in. high; flowers 6 to 8 lines broad; petals white or creamy-white, exceeding the calyx. — High montane, 4000 to 10,500 ft.: Sierra Nevada from Tuolumne Co. to Tulare Co.; s. to the San Gabriel Mts. and San Jacinto Mts. (Drymocallis gracilis Rydb.) Var. FÍSSA Jepson n. comb. Petals sulphur-yellow, 5 lines long, exceeding the calyx-lobes; herbage viscid-pubescent to subglabrous; leaves 9 to 11-foliolate. — Butte Co. to Modoc Co.; n. to Alb., e. to Colo. (P. fissa Nutt.) Var. INCÌSA Lindl. Caespitose; leaflets more deeply incised, or doubly serrate; flowers small, pale yellow.—Meadows, rare: Mt. Silliman; South Yollo Bolly; Nev. to Wash. and Ida. Var. MONTÍCOLA (Rydb.) Jepson n. comb. Plants reduced, 2½ to 6 in. high; stems slender, few-flowered; petals 2½ to 4 lines long.—High montane, 6500 to 8225 ft.: San Gabriel Mts.; Sierra Nevada; Warner Mts. (Drymocallis glandulosa var. monticola Rydb.)

481. Potentilla glandulosa Lindl.; *a*, fl. branchlet x ⅓; *b*, leaf x ⅓; *c*, fl. x 1.

10. **P. pennsylvànica** L. var. **strigòsa** Rydb. Stems several, erect or ascending, 4 to 9 in. high; leaves chiefly basal, the stems bearing 2 or 3 reduced leaves; herbage (especially stems and under side of leaves) pilose, the spreading hairs arising from a close gray pubescence; leaves pinnate, 1 to 3 in. long, on petioles nearly as long; leaflets (5 or) 9 to 11, 8 to 11 lines long, broadly oblong, pinnately cleft to below middle into regular linear-oblong segments, the segments with revolute margins; cyme 5 to 7 (or 10)-flowered; flowers 3 to 5 lines broad; petals yellow, erect, roundish-obovate, truncatish or obtuse; stamens 11 or 16 to 19.—White Mts., e. Inyo Co.; e. to Rocky Mts., n. to Canada.

11. **P. drummóndii** Lehm. Stems erect or nearly so, few-leaved, slightly hairy, 5 to 12 (or 16) in. high; herbage green, soft-pubescent; stipules ovate-lanceolate, about ¾ in. long; basal leaves pinnate, but leaflets often so crowded as to appear digitate, hairy, especially when young; petioles 1½ to 5 in. long; leaflets 5 to 9 (or 11), oblong-obovate to roundish, cuneate at base, cleft into acute teeth or sometimes unequally and rather deeply laciniate, ½ to 1¾ in. long; flowers long-pediceled, bright yellow, 8 to 9 lines broad; petals obcordate, exceeding the calyx-lobes; stamens about 20; achenes many.—High montane, 6000 to 9000 ft.: Hockett Mdw., Tulare Co.; Placer and Nevada Cos.; n. Humboldt Co. to Siskiyou Co; n. to B. C. Rare with us. (P. cascadensis Rydb.)

12. **P. brèweri** Wats. Fig. 482. Stems from a stout scaly root-crown, horizontally spreading or diffuse, 2 to 7 (or 10) in. long; herbage, especially the leaves, silky-villous or silvery; leaves pinnate, ½ to 1½ in. long, the petioles ½ to as long; leaflets 7 to 9, crowded or discrete, deeply incised, 3 to 6 lines



482. Potentilla breweri Wats.; *a*, habit x ⅔; *b*, fl. x 1; *c*, stamen x 5.

long; stipules broad, mostly incised; flowers 6 to 8 lines broad; petals yellow, roundish, retuse, or obcordate with obtuse sinus; stamens 20; achenes 20 to 25.—Alpine or subalpine, 7000 to 13,000 ft., in exposed situations, common: Sierra Nevada from Tulare Co. to Nevada Co.; Siskiyou Co. Var. EXPÁNSA Wats. Stems coarser, more erect, 7 to 14 in. high; leaves 2 to 6 in. long, the leaflets 7 to 11; herbage less silvery or greenish; cymes loosely expanded, the flowers on long pedicels.—Gravelly meadows, Sierra Nevada and Siskiyou Co. Var. VIRÍDIA Jepson n. var. Herbage green.—Volcano Creek, Mt. Whitney (Jepson 4950, type).

13. **P. hickmánii** Eastw. Stems decumbent, 2 to 4 in. long; herbage sparingly strigose; basal leaves pinnate, 1 to 2 in. long, on petioles ¼ to ⅓ as long; leaflets 9 to 11, cuneate-obovate, digitately 3 to 4-cleft, 4 to 6 lines long; cymes few-flowered, the flowers 7 to 12 lines broad; petals golden, obcordate; stamens 20.—Along the coast, San Mateo Co. to Monterey Co.

14. **P. platténsis** Nutt. var. **millefòlia** Jepson n. comb. Low, the slender stems 3 to 6 in. long; herbage sparingly pilose; basal leaves pinnate, 2 to 7 in. long, the outline with the margins nearly parallel, the petioles about 3 to 6 lines long; leaflets about 9 to 15, cleft into 3 to 5 linear acute segments, loosely hairy to glabrous, 4 to 7 lines long; cyme open; flowers about 6 lines broad; petals yellow or yellowish, obcordate, exceeding the calyx-lobes; stamens about 20; achenes 25 to 40, smooth.—Mt. valleys, Sierra Co. to Modoc Co. and e. Siskiyou Co. (P. millefolia Rydb.) Var. KLAMATHÉNSIS Jepson n. comb. Herbage grayish, the hairs spreading.—Interior plateau from ne. Shasta Co. to Klamath Co., Ore. (P. klamathensis Rydb.)

15. **P. wheèleri** Wats. Stems several from the base, decumbent, leafy, 1 to 6 (or 10) in. long; densely silky-villous; leaves palmate, 3 to 5-foliolate; leaflets cuneate, 3 to 5-toothed at the rounded summit, 4 to 10 lines long (very unequal in size on a plant); stipules entire or nearly so; cyme much-branched, the lower flowers axillary; flowers 5 to 5½ lines broad; petals yellow, obcordate, 1¾ lines long, slightly exceeding the calyx; stamens 20; achenes about 30.—High montane, 6800 to 11,400 ft.: Sierra Nevada in Tulare Co.; San Bernardino Mts.; San Jacinto Mts. Var. PAUPÉRCULA Jepson n. var. Alpine dwarf; stems about 1 in. long; leaflets folded, densely silky, 1½ to 2½ lines long; cyme dense, glomerate, about 5-flowered.—Summit of Mt. San Gorgonio, 11,400 ft. (W. C. Blasdale, type).

16. **P. pseudosericea** Rydb. Stems spreading, 1 to 4 in. long, these and the leaves caespitose; herbage densely white-silky, lower stipules brown and scarious; leaves palmate, sometimes a little pinnate; leaflets 3 to 5 lines long, divided into linear obtuse segments; cyme few-flowered; flowers 3 lines broad; petals yellow, obovate, equalling or slightly exceeding the calyx-lobes.—High montane, 11,000 to 13,000 ft.: Olancha Peak, Inyo Co.; White Mts., Mono Co.; e. to Rocky Mts.

17. **P. rubricáulis** Lehm. Stems 2 to 3 in. long, these and the leaves tufted; leaves with 3 (or 5) terminal leaflets, often with an additional pair below; leaflets deeply cleft into linear-oblong segments, green and appressed pilose above, white-silky beneath, 4 to 7 lines long; flowers few in a subcapitate cyme, 3½ lines broad; petals yellow.—Alpine, White Mts., 13,200 ft.; e. to Col.

18. **P. dissécta** Pursh. Stems erect, 6 to 11 in. high; leaves mostly basal, somewhat pilose or silky, but green on both sides, digitate, or in any case

the leaflets approximate at summit of the petiole, on petioles 1 to 3 in. long; leaflets 5 to 7, oblanceolate or cuneate-obovate, ½ to 1½ or 2 in. long, pinnatifid into triangular or lanceolate teeth; flowers 7 to 9 lines broad; petals yellow, obcordate, or obovate and emarginate, about ⅓ longer than the calyx-lobes; stamens 20.—High montane, 8500 to 9500 ft.: Sierra Nevada from Tulare Co. to Mariposa and Mono Cos.; e. to Col., n. to Brit. Am.

19. **P. flabellifórmis** Lehm. Stems strict, or nearly so, 2 ft. high, erect, thinly silky-strigose; leaves digitate, green above and appressed silky-hairy, white below with a felt-like tomentum, the veins silky-hairy; leaflets 2½ to 3½ in. long, pectinately divided into narrowly linear lobes, the lobes generally stiffish and with revolute margins; cyme mostly loose, sometimes dense, usually many-flowered; flowers 7 to 8 lines broad; petals yellow, obcordate, a little exceeding the calyx-lobes; stamens 20; achenes many.—Mt. valleys, Modoc Co.; e. to northern Nev., n. to B. C. and Saskat. Var. CTENÓPHORA Rydb. Segments of leaflets broader, the margin not revolute.—Inyo Co. and n.

20. **P. grácilis** Dougl. Stems erect or nearly so, 1 to 1½ ft. high, villous-pubescent; leaves palmately 5 to 7-foliolate, the basal long-petioled, tufted, the cauline 1 or 2, often subsessile; leaflets obovate or oblanceolate, deeply pinnatifid-serrate with the teeth pointing upward, ¾ to 2¼ in. long, in the typical form with the upper surface very dark green and thinly hairy and the lower surface densely white-tomentose or silky-hairy; flowers 8 to 9 lines broad, many in a large loose cyme; petals yellow, obcordate, exceeding the sepals; stamens 20 to 29; achenes many.—Western margins of the interior great plateau or desert region, or "islands" or "tongues" associated with it, mostly 2000 to 5200 ft.: San Bernardino Mts.; Mt. Pinos; e. side of the Sierra Nevada; e. Humboldt Co.; n. to B. C. and western Mont. Somewhat rare in Cal. Closely connected by intermediate forms with the first-named variety. Var. RÍGIDA Wats. Fig. 483. Leaflets subglabrous, or thinly or densely long-hairy below, the hairs not matted into a dense tomentum.—Montane, 3000 to 8500 ft.: San Diego Co. to Siskiyou Co., common, especially w. slope Sierra Nevada; n. to B. C. Var. FASTIGIÀTA Wats. Low, stout, tufted, the stems 5 to 10 in. high, villous; leaves silky-villous.—High montane, 4500 to 11,000 ft.: San Jacinto Mts.; Tuolumne Co. and Alpine Co. in the Sierra Nevada; e. to Rocky Mts. Var. BLASCHKEÀNA Jepson n. comb. Very robust; teeth of the leaflets elongate; leaves scantily appressed-hairy above, more thickly hairy below, the veins with longer hairs; stipules large, ¾ in. long.—Sierra Nevada from Tulare and Inyo Cos. to Siskiyou Co.; Santa Cruz Mts.; North Coast Ranges. (P. blaschkeana Turcz.) Var. HÁLLII (Rydb.) Wolf. Flowers small (about 5 to 6 lines broad).—Montane, Fresno Co. (P. hallii Rydb.)

483. Potentilla gracilis var. rigida Wats.; *a*, leaf x ⅓; *b*, fl. branchlet x ½; *c*, calyx x ¾.

21. **P. flabellifòlia** Hook. Fig. 484. Stems slender, spreading or ascending, 2½ to 7 (or 14) in. high; herbage finely pubescent or glabrate; leaves few, mostly basal, on petioles ½ to 5 in. long; leaflets 3, thin, all sessile or nearly so, or the middle leaflet stalked, ½ to 1 in. long, fan-shaped, incisely

and somewhat obtusely many-toothed; cyme 1 to 3-flowered, loose; flowers 8 to 10 lines broad; petals bright yellow, deeply notched at apex, 1½ to 2 times as long as the calyx-lobes; stamens about 20.—High montane in pine woods or subalpine in moist meadows, 7300 to 12,200 ft.: Sierra Nevada from Tulare Co. to Modoc Co.; n. to B. C. Var. GRAYI Jepson n. comb. Stems 2 to 5 in. high; leaves glabrous or nearly so, on petioles ¼ to 1 in. long; leaflets coarsely and acutely 5 to 7-toothed (the teeth somewhat triangular), 3 to 9 lines long, the terminal leaflet distinctly stalked.—Subalpine, 8000 to 9000 ft.: Sierra Nevada from Tulare Co. to Mariposa Co. (P. grayi Wats.)

484. Potentilla flabellifolia Hook.; *a*, habit x ½; *b*, long. sect. of fl. x 1.

22. **P. campéstris** (Rydb.) Jepson n. comb. Fig. 485. Stems ascending or spreading, 3 to 10 in. high; herbage villous but green; basal leaves numerous, 2 to 3 lines wide, 2 to 3 in. long, on petioles ¼ to ½ as long; cauline leaves few and reduced; leaflets 1 to 3 lines long, 2 to 4-divided into oblanceolate divisions; cyme compact or capitate; flowers 2 to 3 lines broad; bractlets narrow, linear-lanceolate, noticeably shorter than the lanceolate calyx-lobes; petals 5 (or sometimes 4), widely spreading, pale yellow, spatulate-obovate or rhomboid with conspicuous claw, the broad blade often truncate or slightly emarginate at apex; stamens 15 to 20; filaments filiform; pistils 10, but not all maturing.—High montane meadows, 8000 to 8500 ft., upper Kern, Kaweah and Kings rivers in the s. Sierra Nevada. (P. utahensis var. campestris Jones.)

485. Potentilla campestris Jepson; *a*, habit x ⅓; *b*, long. sect. of fl. x 3.

23. **P. unguiculàta** Greene. Stems many, ascending, 5 to 15 in. high, the basal and cauline leaves 2 to 4 in. long, on petioles ⅛ to ½ as long; herbage villous but green; leaflets crowded, 3 or 4-cleft into linear divisions, 1½ to 2½ lines long; cyme compact, leafy-bracted; flowers 4 lines broad; calyx rose or purplish, its segments sharply acuminate; petals white, spatulate or obovate with rounded apex, at base drawn down to a long narrow claw; stamens commonly 15, though some may be lacking; filaments filiform. — Montane, 5000 to 8000 ft., Sierra Nevada from Mariposa Co. to Fresno Co.

24. **P. pickeringii** (Torr.) Greene. Fig. 486. Stems erect or spreading, 10 to 16 in. high; herbage white silky-villous; basal leaves numerous, 4 to 7 in. long, on petioles about ⅓ as long; cauline leaves 5 to 10, 2 in. long; leaflets numerous, at first closely imbricated, 2 to 5-parted, 2 to 6 lines long, the segments oblong to oblong-elliptic; branches of the cymes with the flowers in dense terminal clusters; flowers 4 to 5 lines broad; petals white or yellowish, roundish-obovate, truncate or emarginate-mucronate, tapering to a narrow claw, 1½ to 2 lines long, exceeding the calyx-lobes; stamens 20; filaments filiform.—Dry valleys of the eastern summits or east side of Sierra Nevada, 4000 to 5500 ft., from Nevada Co. to Siskiyou Co.; e. to Nev. (Horkelia sericoleuca Rydb.)

486. Potentilla pickeringii Greene; *a*, fl. branchlet x ½; *b*, leafy base of stem x ¼; *c*, leaf x ⅓; *d*, leaflet x 1; *e*, long. sect. of fl. x 3.

25. **P. purpuràscens** (Wats.) Greene. Stems erect, 6 to 15 in. high; herbage pubescent and somewhat villous or slightly grayish; leaves 2 to 8 in. long, on petioles ½ to 1¼ in. long; leaflets numerous, usually closely crowded, 2 to 4-parted, 2 to 3 lines long; cyme commonly open, few-flowered; flowers 4 lines broad; calyx purplish, bowl-shaped, about 4 lines long; bractlets small and narrow; petals white, rotate, broadly cuneate-oblong, truncate or slightly retuse, equalling the calyx; stamens 20, those opposite the calyx-lobes longest; filaments subulate-dilated, often scabrous or minutely pubescent; achenes 20 to 25.—Summit valleys and meadows, 6600 to 8000 ft., Sierra Nevada in e. Tulare Co. Var. CÓNGDONIS Jepson n. comb. Coarser, 13 to 24 in. high; herbage greenish, less pubescent, a little glandular; petals obtuse.—East side of the Sierra Nevada in Inyo and Mono Cos.; also Alta Mdws., Tulare Co. (Horkeliella congdonis Rydb.)

487. Potentilla santolinoides Greene; *a*, habit x ⅓; *b*, long. sect. of fl. x 2.

26. **P. argyrócoma** (Rydb.) Jepson n. comb. Stems spreading, 4 to 8 in. high, densely silky-villous; basal leaves numerous, 1 to 2 in. long, on petioles ½ to ¾ in. long; cauline leaves 1 or 2, 1 in. long; leaflets densely imbricated, 2 or 3-parted, the segments oblong-elliptic, 1 line long; cyme open or somewhat dense, its forks ending in subcapitate clusters; flowers 4 lines broad; bractlets oblong-lanceolate, half as long as the lanceolate sepals; petals white, spatulate, exceeding the sepals; sta-

mens 20; filaments somewhat dilated.—San Bernardino Mts., 6000 ft. (Horkelia argyrocoma Rydb.)

27. **P. santolinoides** (Gray) Greene. MOUSE TAIL. Fig. 487. Plants ½ to 1 ft. high, the stems slender, erect, nearly naked, subglabrous, diffusely branched above and forming an open panicle of cymes; leaves terete, densely silvery-villous, 1 to 4 in. long, on petioles 3 to 5 lines long, very numerous, the minute leaflets closely imbricated; flowers 3½ to 4 lines broad; petals white, orbicular, exceeding the short calyx-lobes; stamens 14 to 16; anthers purple; pistil only 1.—Montane, 7200 to 10,000 ft.: Sierra Nevada from Eldorado Co. to Kern Co.; e. Ventura Co.; San Gabriel Mts.; San Bernardino Mts.

28. **P. shóckleyi** (Wats.) Jepson n. comb. Stems nearly naked, 2 to 3 in. high, these and the leaves densely tufted; leaves similar to P. gordonii; herbage finely glandular-puberulent, the leaflets bristle-tipped; cyme 4 or 5-flowered, distinctly racemose; flowers 2½ to 3½ lines broad; petals white, ovate, shorter than the calyx-lobes; stamens 5.—Rocky summits of high peaks, eastern crests of the Sierra Nevada from Silver Peak, Alpine Co., to Tinker's Knob, Eldorado Co. (Ivesia shockleyi Wats.) Var. CÁLLIDA Jepson n. comb. Stamens 20.—Tahquitz Peak, San Jacinto Mts., 8000 ft. (P. callida Hall.)

488. Potentilla gordonii Greene; *a*, habit x ½; *b*, leaflet x 3.

29. **P. gordònii** (Hook.) Greene. Fig. 488. Stems erect, nearly naked, 1 to 6 in. high, increasing in length ½ to 2 in. after anthesis; herbage minutely viscid-pubescent, or often somewhat hirsute; leaves basal, narrowly linear in outline, ½ to 3½ in. long, on petioles ⅕ to ⅓ as long; leaflets numerous, densely set, 1 to 1½ lines long, 3 to 5-cleft nearly to the base into obovate segments; cyme more or less dense; flowers 3 to 4 lines broad; petals yellow, 1½ lines long, at first almost orbicular, exceeding the sepals, becoming spatulate after anthesis and then shorter than the accrescent calyx-lobes; stamens 5.—Alpine or subalpine, 8000 to 13,000 ft.: Sierra Nevada; Mendocino and Trinity Cos.; n. to Wash., e. to Col. and Mont. Variable in size, character of pubescence and shape of leaves, which resemble those of Yarrow on a small scale. Var. MEGALOPÉTALA Jepson n. comb. Leaves larger (2 to 3 in. long); petals larger (2 lines long).—Mariposa and Mono Cos., mostly lower altitude than the species. (Ivesia megalopetala Rydb.) Var. SCANDULÁRIS Jepson n. comb. Stems naked; pistils 5 to 10.—Alpine, 12,000 ft., White Mts. (Horkelia scandularis Rydb.) Var. URSINÒRUM Jepson n. var. Leaves grayish with a short stiff pubescence.—Bear Creek, Trinity Mts. (Alexander & Kellogg 313, type). Var. PYGMAÈA (Wats.) Jepson n. comb. Stamens 10.—Alpine, rock crevices: Sierra Nevada in e. Tulare Co., 9000 (or to 12,000) ft. (Ivesia gordonii var. pygmaea Wats.) Var. LYCOPODIOÌDES (Gray) Greene. Petals oblanceolate.—High peaks: Mt. Dana to Eagle Peak (Modoc Co.). (Ivesia gordonii var. lycopodiodes Wats.) Var. CHAETÓPHORA Jepson n. comb. Cyme open, flat-topped; stamens 10.—High montane, Tulare Co. (Ivesia chaetophora Rydb.)

30. **P. mùirii** (Gray) Greene. Stems slender, naked except for a pair of reduced or minute leaves at the middle, 2 to 6 in. high; herbage silvery-silky; basal leaves tufted, 1 to 1½ in. long, terete with the numerous minute

leaflets closely covering the axis (''mouse-tail'' type), the petioles very short; cyme with 2 or 3 forks, the flowers in subcapitate clusters, or the cyme reduced to a single terminal head; flowers 1½ to 2 lines broad; petals yellow, oblong-spatulate, ½ the length of the sepals; stamens 5, the filaments filiform or subulate-filiform; achenes usually 2.—Gravelly alpine slopes, 11,000 to 11,500 ft. in the central Sierra Nevada: Mt. Conness; Mt. Hoffman; Silver Pass; Mt. Goddard. (Ivesia muirii Gray. Horkelia chandleri Rydb.)

31. **P. wébberi** Greene. Stems reddish, slender or wiry, scantily pilose, 2 to 4½ in. high, naked save for a pair of leaves at the middle; leaves loosely villous; basal leaves ¾ to 1 in. long, on petioles as long; leaflets 2 to 3 lines long, approximate, 2 to 5-parted into linear acute segments; cyme subcapitate, leafy-bracted; flowers 3 to 3½ lines broad; petals yellow, oblanceolate, acute, shorter than calyx-lobes; stamens 5; achenes 3 or 4; receptacle densely hirsute. — Montane, 5000 ft., n. Sierra Nevada in Sierra and Plumas Cos.

32. **P. tenuíloba** (Gray) Greene. Stems ascending or erect, 5 to 12 in. high; herbage villous but more or less green; basal leaves 1¼ to 3 in. long on petioles ½ to 1 in. long; leaflets 17 to 31, 2 to 3 lines long, cuneate-obovate, cleft ½ to ⅔ the way into about 4 linear lobes; cymes close; flowers 3 to 3½ lines broad; calyx with linear lobes; petals white, cuneate, notched at apex, exceeding the calyx; stamens 10; filaments oblong-dilated.—Low hills or valleys, uncommon: Coast Ranges from Sonoma Co. to San Luis Obispo Co. (P. micheneri Greene).

33. **P. hispídula** (Rydb.) Jepson n. comb. Stems slender, erect, 6 to 10 in. high; herbage hispid and glandular-pubescent; basal leaves ½ to 3 in. long, on petioles nearly half as long; cauline leaves few, ½ to ¾ in. long; leaflets 16 to 21, fan-shaped or broadly cuneate, divided about half way into 4 or 5 oblong or elliptic lobes, markedly hispid, especially at the tips, 2 to 3 lines long; cyme a little lax, medium-sized, somewhat few-flowered; flowers 4 to 5 lines broad; calyx-lobes triangular-lanceolate, these and the petals rotately spreading; petals white, cuneate-obovate, at apex emarginate to rounded, exceeding the calyx-lobes; stamens 10; filaments white, broadly dilated; achenes 15.—High montane, pine slopes and meadows, 8500 to 11,000 ft.: White Mts. (Horkelia hispidula Rydb.)

34. **P. daucifòlia** Greene. Fig. 489. Stems erect or ascending, rather rigid, 6 to 14 in. high; herbage (especially the leaves) villous; basal leaves 2 to 4 in. long, on petioles ½ to as long; leaflets 11 to 17, 3 to 8 lines long, 2-parted, the segments 2 or 3-cleft into linear divergent lobes; stipules 2 or 3 times divided into filiform segments, long pilose, forming a conspicuous tuft on the root-crown below the erect leaf-blades; cyme rather close or even capitately congested; flowers 5 to 7 lines broad; petals cream-color, spatulate-obovate, truncatish or obtuse, slightly exceeding the calyx-lobes; stamens 10; filaments petaloid-dilated, those opposite the calyx-lobes deltoid; achenes 8 to 12, smooth. — Shasta and Trinity Cos. to Siskiyou Co. Var. INDÍCTA Jepson n. var. Leaf segments filiform or nearly so; petals very broad (somewhat fan-shaped); filaments broadly subulate.—Crane Creek, w. Tehama Co. (Jepson 100p, type).

489. Potentilla daucifolia Greene; *a*, habit x ½; *b*, long. sect. of fl. x 2; *c*, stamens x 5.

35. **P. laxiflòra** Drew. Stems ascending, slender, 9 to 12 in. high; herbage green; leaves sparsely hairy, about 2 in. long, on petioles about as long; leaflets 10 to 12 pairs, 2½ to 4 lines long, 2 to 4-cleft almost to base into linear-lanceolate segments; stipules of basal leaves finely 2 or 3 times dichotomously divided, villous; cyme loose, spreading, compound; flowers 4 to 5 lines broad; calyx-lobes triangular, acute, the bractlets ½ as long; petals white, spatulate-oblong, deeply emarginate, exceeding the calyx-lobes; stamens 10; filaments petaloid-dilated, unequal; achenes 2 or 3, light brown, smooth.—N. Humboldt Co.

36. **P. howèllii** Greene. Stems slender or filiform, purplish, thinly pubescent or glabrate, 8 to 14 in. high, the leaves mostly basal, the cauline few and small; leaves slender, silvery-villous, densely crowded with leaflets, 1 to 2 in. long, on petioles ¼ to ½ in. long; stipules deeply 2-cleft and hairy; leaflets 13 to 21, 1½ to 3 lines long, divided to the base into 2 or 3 segments, the segments oblong or oval, entire, or 1 to 3-toothed; cymes ½ to 3 in. broad, the flowers in clusters of 2 or 3, terminating its slender branches; flowers 3 to 4 lines broad; petals white with pinkish center, obcuneate, retuse, exceeding the calyx-lobes; stamens 10; filaments dilated; achenes 3 to 5.—Red soil, open flats, Del Norte Co.; n. to southwestern Ore.

490. Potentilla parryi Greene; *a*, habit x ½; *b*, fl. x 1½; *c*, stamens x 5.

37. **P. pàrryi** Greene. Fig. 490. Stems ascending, a little leafy, 4 to 8 in. high, offsetting by stolons and forming mat-like colonies 2 to 4 ft. broad; herbage soft-pubescent; leaves 1¾ to 2¼ in. long, on petioles ½ to nearly as long; leaflets about 11, cuneate, toothed at apex, 4 to 6 lines long; cyme diffuse, many-flowered; flowers 4 to 5 lines broad, on slender drooping pedicels 5 to 7 lines long; petals white, obovate, obtuse, entire or toothed laterally at apex, exceeding the calyx-lobes; achenes about 12, gray.—Moist swales in chaparral hills, 800 to 1200 ft., Sierra Nevada foothills from Amador Co. to Mariposa Co. Var. WILDERAE Jepson n. comb. Caespitose, 3 to 7 in. high; leaflets cuneate-obovate, usually incised with the lobes toothed; flowers 2 to 2½ lines broad; pedicels 2 to 5 lines long.—Santa Ana River, San Bernardino Mts., 8000 ft. (Horkelia wilderae Parish.)

38. **P. califórnica** (C. & S.) Greene. Stems stoutish, erect, rather leafy, 1 to 3 ft. high; herbage pubescent and more or less glandular; basal leaves about 6 in. long, on petioles ⅛ to as long; leaflets 9 to 21 (or the upper leaves with fewer leaflets), thickish, cuneate-obovate to orbicular or oblong, more or less doubly incised or toothed above the base, ½ to 1¾ in. long; cyme openly 2 to 4-forked, the branches ending in dense few-flowered clusters and often with solitary flowers in the forks, or sometimes the whole inflorescence capitately congested; flowers 4 to 6 lines broad; calyx cup-shaped, 4 to 6 lines high, about equaling the petals, the calyx-tube commonly purplish or membranous; bractlets commonly exceeding the sepals, 3-toothed, or variably incised, or sometimes entire; petals oblong or spatulate, about 3 lines long; stamens 10, the filaments opposite the calyx-lobes subulate, the others filiform or nearly so.—Wooded slopes or edge of brushy thickets: Coast Ranges from Humboldt Co. to Monterey Co. Var. FRONDÒSA

Jepson n. comb. Leaflets 5 to 9, oblong or oval, shallowly incised; petals shorter than the calyx-lobes (about 1½ to 2 lines long).—Contra Costa Co. to Monterey Co. (P. frondosa Greene.)

39. **P. elàta** Greene. Stems erect, 1½ to 2 ft. high; herbage glandular, pilose-pubescent; basal leaves 3 to 6 in. long, on petioles ½ to as long; leaflets 15 to 19, thin, cuneate-obovate, 4 to 9 lines long, once or twice incisely cleft; cyme dichotomously forked, the flowers solitary or in 3s, 5 lines broad; bractlets of the calyx equaling the lobes, lanceolate; petals white, spatulate; stamens 10, 5 short and with filiform filaments, the other 5 with filaments deltoid-dilated at base.—Lower mt. slopes, 1000 to 5000 ft.: middle North Coast Ranges from Napa Co. to Lake and Mendocino Cos.; Sierra Nevada from Fresno Co. to Amador Co.

40. **P. douglásii** Greene. Stems ½ to 1½ ft. high, more or less glandular-pubescent; leaves mostly sub-basal, 2 to 4 in. long, on petioles 1 to 1½ in. long; leaflets about 11, cuneate to cuneate-obovate, deeply toothed at apex or above the middle, 3 to 6 or rarely 9 lines long; flowers 2½ to 3 lines broad; calyx somewhat purplish; petals white, cuneate, truncate or retuse, exceeding the calyx-lobes; stamens 10, filaments dilated, those alternate the petals broadly dilated.—Montane, 3400 to 8200 ft.: Sierra Nevada from Fresno Co. n. to Modoc Co., thence w. to Siskiyou Co.; n. to Wash. and Ida. (Horkelia fusca Lindl. P. fusca Jepson.) Var. TENÉLLA Greene. Low (4 to 8 in. high), the stems glandular above; leaflets incised below the middle into linear segments.—Tulare Co. to Tehama Co., thence w. to Trinity Co.

41. **P. bolánderi** (Gray) Greene. Stems ascending, very sparingly leafy, 2 to 10 in. high, these and the leaves mainly tufted; leaves densely white-silky, 1 to 2 in. long, on petioles ½ to nearly as long; leaflets (11 or) 15 to 27, cuneate-obovate, 2 to 3 lines long, toothed or cleft at apex, the teeth acute; cyme open or dense; flowers 4 lines broad; calyx-lobes and bractlets lanceolate; petals oblong-spatulate, rounded and emarginate, or acute; stamens 10, filaments dilated; achenes minutely granular.—Dry hills: inner North Coast Range from sw. Colusa Co. to Lake Co. and s. to Mt. Hamilton Range and Mt. Pinos. (Horkelia bolanderi Gray.) Var. BERNARDÌNA Jepson n. comb. Stems mostly 10 to 15 in. high; herbage less densely pubescent; calyx 3 lines long; leaflets 3 to 4 lines long, typically longer than broad; petals emarginate or rounded at apex.—Montane, 4000 to 7500 ft.: San Gabriel Mts.; San Bernardino Mts. (Horkelia bernardina Rydb. H. bolanderi var. parryi Wats.) Var. CLEVELÁNDII Jepson n. comb. Stems erect, several from the short caudex, 5 to 18 in. high; herbage grayish pubescent; leaflets fan-shaped or roundish, broadly cuneate at base, deeply toothed at apex, 2 to 6 lines long, typically broader than long; flowers 5 to 6 lines broad; petals obovate, obtuse or emarginate.—Montane, 5000 to 7000 ft.: San Jacinto Mts. to Cuyamaca Mts.; s. to L. Cal. (P. clevelandii Greene.)

42. **P. líndleyi** Greene. Stems erect or ascending, many from the root-crown, 7 to 20 in. high; herbage pubescent, more or less glandular; leaves mostly basal, 3 to 3½ in. long, the petioles 1 (to 2) in. long; leaflets roundish to cuneate-obovate, sharply toothed above the base, 4 to 7 lines long; cymes with many flowers, rather crowded; flowers 3½ to 4½ lines broad; calyx-tube cupulate, the ovate bractlets smaller than the lobes; petals white, oblong-oblanceolate, obtuse, ⅓ longer than the sepals; stamens 10, the filaments dilated, the alternate larger and more strongly triangular-subulate.—Near the coast, Santa Cruz Co. to Santa Barbara Co. (P. cuneata Baill. Horkelia cuneata Lindl. P. multijuga Fl. W. Mid. Cal.) Var. PUBÉRULA Jepson n. comb. Stems few, erect, 9 to 22 in. high; cymes narrow to diffuse; flowers 7 lines broad.—Valleys and lower hills, 1000 to 2000 ft.: Santa Barbara Co. to San Diego Co. and e. to the San Bernardino Valley. (P. puberula Greene.)

P. TRUNCÀTA (Rydb.) Jepson n. comb. Leaflets 5 to 7, obovate, truncate, finely crenate, more deeply toothed at apex; filaments broadly triangular,

491. Potentilla congesta var. tilingii Jepson; *a*, habit x ½; *b*, fl. x 3; *c*, stamens x 10.

those opposite calyx-lobes broader than long.—Said to grow at Ramona, San Diego Co. (Horkelia truncata Rydb.)

43. **P. kellóggii** Greene. Too like no. 42; herbage white-silky, obscurely glandular; cymes dichotomous; leaflets broadly obovate, toothed above the cuneate base, ½ to 1 in. long; flowers 6 to 7 lines broad.—Along the seacoast: Alameda; San Francisco; Monterey. (Horkelia californica var. sericea Gray.) Var. MARINÉNSIS (Elmer) Jepson n. comb. Smaller, stems decumbent; leaflets shaggy-villous. — Sand flats, Point Reyes. (Horkelia bolanderi var. marinensis Elmer.)

44. **P. congésta** Hook. var. **tilíngii** Jepson n. comb. Fig. 491. Stems ascending or erect from a decumbent base, more or less leafy below, 5 to 13 (or 17) in. high; herbage silky-villous; leaves with 5 to 9 (or 11) approximate leaflets; leaflets cuneate, varying to cuneate-elliptic or linear-oblong, usually 3-toothed at apex (otherwise entire), 4 to 6 (or 11) lines long; cyme much-branched, commonly rather open with the branches bearing capitate clusters, or the whole cyme rather dense, or the clusters reduced to one; flowers on slender pedicels, 2 to 2½ lines broad; calyx reddish; petals white, linear-oblong or narrow oblanceolate, acute at both ends, little longer than the calyx-lobes; stamens 10, the filaments more or less dilated at base or narrowly triangular; achenes smooth or rough-lineate.—Montane, common on sandy flats or ridges of open forests, 3000 to 6500 ft.: Sierra Nevada from Tulare Co. to Modoc Co.; Coast Ranges from Lake Co. to Siskiyou and Humboldt Cos.; n. to Ore. (Horkelia tilingii Regel. H. tridentata Torr.) P. congesta Hook., of s. Ore., has broadly obovate petals. Both petals and filaments are, however, variable in shape.

11. GÈUM L.

Perennial herbs. Leaves lyrately pinnate. Stipules adnate to the sheathing petioles. Flowers rather large, solitary or corymbose. Calyx persistent, 5-lobed, usually with 5 alternate bractlets. Stamens many. Pistils numerous, borne on a clavate or hemispheric receptacle; ovule 1. Achenes small, tipped with the elongated styles. (The Latin name.)

492. Geum macrophyllum Willd.; *a*, leaf x ¼; *b*, fl. branchlet x ½; *c*, fr. head x ½; *d*, fr. x 1.

Style jointed and kinked near the middle, the upper part deciduous, the lower hooked, naked; achenes and styles strongly deflexed in fruit; calyx-lobes reflexed.
Terminal leaflet round-cordate; receptacle naked or nearly so....1. *G. macrophyllum.*
Terminal leaflet cuneate-obovate; receptacle densely short-hairy.....2. *G. strictum.*
Style straight, not jointed, wholly persistent, plumose, much elongated; achenes and styles erect or spreading in fruit; calyx-lobes not reflexed.....3. *G. triflorum.*

1. **G. macrophýllum** Willd. Big-leaf Avens. Fig. 492. Stems coarse, mostly solitary, bristly, leafy, 1 to 3¼ ft. high; basal leaves 4 to 15 in. long (including the petiole), the leaflets incised and serrate; terminal leaflet very large, round-cordate (3 to 3½ in. long), the lateral ones downwardly smaller and with very small ones between; flowers 6 lines broad, in an open cyme; petals yellow; bractlets of the calyx small, often wanting; receptacle oblong; achene hairy above, tailed with a naked style, the persistent part hooked.—Montane, 3000 to 9000 ft.: San Bernardino Mts.; White Mts.; Sierra Nevada from Tulare Co. n. to Siskiyou Co.; n. to Alas., e. to Nfd.; Asia.

2. **G. strictum** Ait. Yellow Avens. Similar to no. 1; stems bristly; leaflets cuneate-obovate.—Siskiyou Co. to Lassen Co.; n. Mex. to B. C. and Nfd.

3. **G. triflòrum** Willd. Old Man's Whiskers. Fig. 493. Stems clustered, simple, nearly naked, 6 to 14 in. high; herbage pilose; leaves 1½ to 7 in. long including the short petiole; leaflets many, somewhat crowded, cuneate, toothed and incised, ¾ to 1½ in. long; flowers few, broad, borne on long peduncles; calyx dull reddish; bractlets linear, 4 to 9 lines long; petals purplish; receptacle small, hemispherical; tails of the achenes plumose, at length ¾ to 1½ in. long.—Montane, 400 to 8500 ft.: high eastern summits and valleys of the Sierra Nevada from Alpine Co. to Siskiyou and Modoc Cos.; n. to Alb., e. to Nfd.

493. Geum triflorum Willd.; *a*, basal leaf x ½; *b*, fl. branchlet x ½; *c*, fr. head x ½; *d*, fr. x 1.

12. **FALLÙGIA** Endl.

Low deciduous shrub with pinnately lobed leaves and revolute margins. Flowers white, showy, solitary on the ends of long nearly naked peduncles. Receptacle flat. Calyx-tube short-hemispherical, the 5 ovate lobes with alternate linear bractlets. Petals orbicular. Stamens numerous, inserted in 3 rows upon the margin of the calyx-tube. Pistils numerous, glabrous. Style terminal, very villous at the base, twisted, persistent. (V. Falugi, abbot of Vallombrosa.)

1. **F. paradóxa** Endl. Apache Plume. Much branched, 1 to 5 ft. high; branchlets slender, elongated, with white, soon exfoliating epidermis; herbage pubescent, the under side of the leaves and the calyx usually rusty; leaves more or less fascicled, 3 to 6 lines long, cleft into 3 to 5 linear obtuse segments with revolute margins; flowers 1 to 1½ in. broad; achenes very numerous, the thread-like plumose tails 1 in. long.—Gravelly or rocky slopes: Providence Mts.; s. Nev. to Col. and Mex. May.

13. **COWÀNIA** Don.

Shrubs or small trees. Leaves small, pinnately lobed, coriaceous, gland-dotted. Flowers showy, solitary and terminal on the short branchlets. Calyx with broadly clavate tube. Petals orbicular or obovate, spreading. Stamens

numerous, in 2 rows. Pistils about 5 to 10, densely villous; style terminal; ovule solitary. Achenes coriaceous, striate, nearly included in the enlarged calyx-tube, tailed with the elongated plumose style. (James Cowan, British merchant and botanical amateur, died at Lima, 1823.)

1. **C. mexicàna** Don var. **stansburiàna** Jepson n. comb. CLIFF ROSE. Freely branching shrub, 1 to 3 ft. high; leaves tending to be fascicled on the short branchlets, 3 to 4 lines long, pinnately 3 to 5-parted into short linear lobes, dark green above, white-tomentose beneath, the margin somewhat revolute; flowers white, 6 to 9 lines broad; calyx-tube glandular-pubescent, attenuate into a short pedicel; calyx-lobes roundish; tail of the achene 1½ to 2 in. long.—Mesas and cañon sides; e. Mohave Desert; Death Valley region; e. to Utah, s. to Mex. June. (C. stansburiana Torr.) Var. DÙBIA Bdg. Flowers perfect and staminate; stamens fewer; pistils 2 or 3; tails of the fruit short, not plumose but densely hairy.—Providence Mts.

14. **RÒSA** L. ROSE

Prickly shrubs with pinnate leaves and adnate stipules. Flowers large, ours mostly rose-pink, solitary or in corymbs or panicles. Calyx-tube globose or urnshaped, becoming fleshy in fruit; calyx limb 5-parted. Petals 5 (rarely 6, 7 or 8), rounded or in ours mostly obcordate, spreading, inserted with the numerous stamens on the edge of the thin disk which lines the calyx-tube within and bears toward the base the numerous distinct pistils. Ovaries hairy, becoming bony achenes. Achenes enclosed in the globose or urnshaped calyx-tube or "hip." (The Latin name.)

Calyx-lobes persistent on hips; leaflets 5 or 7, sometimes 9, mostly ½ to 1½ in. long.
Leaves resinous-pubescent beneath ..... 1. *R. nutkana.*
Leaves not resinous beneath; hips constricted into a short neck below calyx-lobes.
Plants 3 to 5 ft. high or more; calyx-tube mostly glabrous.
Stipules narrow, with the free tips commonly lanceolate.
Spines stout, curved; herbage mostly pubescent ..... 2. *R. californica.*
Spines slender, straight; herbage glabrate or nearly .. 3. *R. mohavensis.*
Stipules strongly enlarged upwards and sagittate in outline ... 4. *R. pisocarpa.*
Plants about ¾ to 1 ft. high; calyx-tube mostly glandular-hispid .. 5. *R. spithamea.*
Calyx-lobes deciduous from fruit; leaflets 5, 7, or 9, sometimes 11, mostly ¼ to ½ (or ¾) in. long ..... 6. *R. gymnocarpa.*

494. Rosa californica C. & S.; *a*, leaf; b, fl. branchlet; *c*, fr. x ½.

1. **R. nutkàna** Presl. Stout, 2 to 5 ft. high; prickles stout, usually straight, or sometimes unarmed; leaves resinous-pubescent beneath; stipules subequal in width from base to apex, mostly glandular-ciliate; flowers solitary or 2 to 4 together, the pedicels often prickly and glandular; calyx-tube glabrous, its lobes prolonged into foliaceous, serrate or laciniate appendages; petals obcordate, ¾ to 1 in. long; hips globose or depressed-globose, 5 to 7 lines in diameter. — Humboldt and Siskiyou Cos.; n. to Alas., e. to Utah. May-June. The largest flowered western species. Var. HÍSPIDA Fer. Calyx-tube with gland-tipped bristles.—Eureka.

2. **R. californica** C. & S. CALIFORNIA WILD ROSE. Fig. 494. Stout, 3 to 6 ft. high; prickles few or numerous, mostly stout and recurved, usually also with one or a pair below the stipules; leaves puberulent or pubescent, especially beneath, and more or less glandular; stipules narrow, with lanceolate tips, sometimes

glandular-denticulate; flowers few to many, often 20 to 40 in a panicle; calyx-tube glabrous, its lobes mostly prolonged into foliaceous serrate appendages; petals obcordate, ¾ to 1 in. long; pedicels hairy and more or less glandular; hips globose or ovoid, 4 to 8 lines broad, somewhat constricted below the calyx-lobes.—Common everywhere along river and creek banks and margins of springs at the lower and middle altitudes throughout Cal., often forming small thickets. May-Nov., flowering most freely in June. It is a highly variable species in pubescence, number of flowers and shape of hips. Prickles often 3 to 6 lines long at base and 3 to 5 lines high. (R. aldersonii Greene). Var. ULTRAMONTÀNA Wats. Tomentose but not glandular; pedicels glabrous.—E. side of the Sierra Nevada; Nev.

3. **R. mohavénsis** Parish. Stems slender; nearly glabrous and non-glandular; prickles scattered, slender, mostly straight, not in pairs below the leaves; flowers solitary or in corymbs of 2 or 3; petals 7 lines long.—Desert side of the San Bernardino and San Gabriel mountains.

4. **R. pisocárpa** Gray. Slender, 3 to 5 ft. high; prickles few, slender and straight, or none; leaves green and glabrous above, paler and often puberulent beneath; stipules strongly and often abruptly dilated upwards and so inversely sagittate; flowers in corymbs or solitary; calyx-lobes prolonged into a slender terminal entire linear or lanceolate appendage, often glandular-hispid; petals obcordate, 6 to 8 lines long; hips globose, 3 to 5 lines in diameter, contracted above into a very short neck.—N. Sierra Nevada; Siskiyou Co.; n. to B. C. This, the mountain form of R. californica, is smaller in all its parts but is deficient in technical characters. Var. GRATÍSSIMA Jepson n. comb. Prickles straight, slender, weak; stipules often broad and often broadest at the middle; leaves thinnish, bright green, glandular, minutely pubescent; stipules not glandular-ciliate.—Tehachapi Mts.; San Gabriel and San Bernardino mountains. (R. gratissima Greene.) Var. RIVÀLIS Jepson n. comb. Glabrous; prickles few or none; leaflets thin, rather prominently feather-veined, 1 to 1½ in. long.—Van Duzen River; Long Valley, Mendocino Co. (R. rivalis Eastw.)

5. **R. spithamèa** Wats. GROUND ROSE. Simple or sparingly branched, about 1 ft. high; prickles few, slender, straight; leaves minutely pubescent and more or less glandular, especially on the petioles; stipules narrow, acute or acuminate; pedicels, calyx-tube and -lobes usually hispid with gland-tipped hairs; flowers solitary or few; calyx with entire linear or lanceolate appendages; petals obcordate, 5 to 8 lines long; hips globose, 3 to 5 lines broad. —Open pine woods at middle altitudes in the Sierra Nevada; and higher North Coast Ranges from Elk Mt., Lake Co., to Humboldt Co. and the Trinity Mts. July. Var. SONOMÉNSIS Jepson. Sonoma Rose. Stems densely armed with stout straight or slightly recurved prickles; leaflets with the teeth minutely glandular-denticulate; flowers several in a corymb; calyx-tube very densely glandular-hispid. — Dry slopes in the outer Coast Ranges from the Santa Cruz Mts. to Mt. Tamalpais and Sonoma Co.

495. Chamaebatia foliolosa Benth.; fl. branchlet x 1.

6. **R. gymnocárpa** Nutt. WOOD ROSE. Slender, 1 to 3 ft. high, glabrous or puberulent, the branchlets and rachis of the leaves densely armed with long slender straight prickles, or sometimes nearly unarmed; leaves 2 to 3 in. long; leaflets ¼ to ¾ (or 1) in. long, elliptic or roundish, obtuse or acute, doubly serrate, the minute teeth gland-tipped; flowers generally solitary or in clusters of 2 or 3; petals 5 to 7 lines long; pedi-

cels glabrous or more frequently clothed with gland-tipped hairs, drooping or curving in fruit; calyx-lobes at length deciduous; hips ovate or pear-shaped or globose, red, 4 to 8 lines long.—Shady woods or bushy north slopes, often near streams, 400 to 5500 ft.: Coast Ranges from Monterey Co. to Humboldt Co.; Sierra Nevada from Mariposa Co. to Siskiyou Co.; n. to B. C. Var. PINETÒRUM Jepson n. comb. Calyx-lobes persistent.—Monterey coast. (R. pinetorum Hel.)

15. **CHAMAEBÁTIA** Benth.

Low glandular-pubescent heavy-scented evergreen bush with dissected fern-like foliage. Leaves thrice pinnate, with numerous minute leaflets and very minute stipules. Flowers white, in loose terminal cymes. Stamens about 50 to 60 in several rows. Pistil one, simple; style densely villous at base; ovule one. Fruit an achene, included in the persistent calyx. (Greek chamae, on the ground, low, and batos, a bramble.)

1. **C. foliolòsa** Benth. MOUNTAIN MISERY. Fig. 495. One to 2 ft. high; leaflets crowded, ½ line long; petals obovate, 3 to 4 lines long.—Mt. slopes, 3000 to 4000 ft.: Sierra Nevada from Nevada Co. to Kern Co., abundant in the lower part of the Yellow Pine belt, commonly gregarious and covering extensive tracts. Also called Bear-mat, Bear-clover, Tarweed, Jerusalem Oak and Running Oak. Var. AUSTRÀLIS Bdg. Leaves oblong-lanceolate in outline; ovary glabrous.—San Miguel Mt. (San Diego Co.); s. to northern L. Cal.

496. Agrimonia eupatoria L.; *a*, leaf x ½; *b*, fl. branchlet x ½; *c*, fr. head x 2½.

16. **AGRIMÒNIA** L. AGRIMONY

Perennial herbs with pinnate leaves and serrate leaflets. Flowers yellow, in racemes. Bracts 3-cleft. Calyx-tube turbinate, contracted at the throat and the upper part beset with a ring of hooked prickles, indurated in fruit and enclosing the 2 achenes; calyx-limb 5-cleft, the lobes closing over the throat after flowering. Stamens 5 to 15. Styles terminal. (Corruption of the Greek word argema, a disease of the eye, the plants reputed medicinal.)

1. **A. eupatòria** L. COMMON AGRIMONY. Fig. 496. Stems erect, 2 to 3 ft. high; herbage glandular, and both hirsute and puberulent; leaflets 5 or 7, with interposed smaller ones, ovate or obovate, 3 lines to 3½ in. long, coarsely toothed, entire at base; flowers 2½ lines long.—Borders of woods in the mts., 2500 to 4500 ft., widely disseminated but rare: Cuyamaca Mts.; San Bernardino Mts.; Sierra Co.; Howell Mt.; n. Lake Co.; n. to Wash., e. to the Atlantic. (A. gyrosepala Wallr.)

17. **ACAÈNA** L.

Perennial herbs with a woody base, pinnate leaves and pinnatifid leaflets. Flowers green, in more or less crowded spikes. Calyx persistent, its tube contracted at the throat, at length armed with retrorsely barbed prickles; limb in ours 5-parted, valvate, deciduous. Petals none. Stamens in ours 3 to 5. Pistil in ours 1; style terminal; stigma multifid-feathery; ovule solitary, suspended. Achene enclosed in the indurated calyx. (Greek akaina, a thorn, in reference to the spines on the calyx.)

1. **A. pinnatífida** R. & P. var. **califórnica** Jepson n. comb. Fig. 497. Stems erect with decumbent base, 5 to 13 in. high, sometimes almost naked, the leaves mostly at base or tufted on the short woody branches of the root-crown; herbage villous; leaflets 11 to 17, nearly uniform, 3 to 4 lines long, pinnately cleft into 3 to 7 segments; calyx-tube in fruit prickly, 4-angled; stamens dark purple, exserted.—Dry or rocky soil of hilltops or n. slopes near the ocean, 25 to 1500 ft.; Contra Costa and Marin Cos. to Monterey Co. May-June. (A. californica Bitt.)

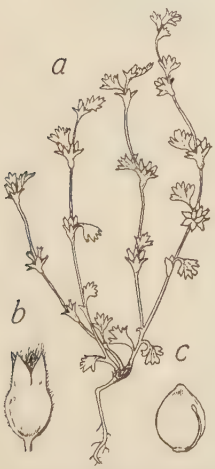
497. Acaena pinnatifida var. californica Jepson; *a*, habit x ½; *b*, infl. x 1; *c*, fl. x 3; *d*, pistil x 6.

18. **SANGUISÓRBA** L. Burnet

Herbs with unequally pinnate leaves. Flowers small, perfect, polygamous or dioecious, crowded in a dense head or spike at the summit of a long naked peduncle. Calyx-tube turbinate, constricted at the throat, persistent, its 4 spreading lobes deciduous. Petals none. Stamens (in ours) 2 or 4. Pistil 1. Achene enclosed in the 4-angled dry calyx-tube. (Latin sanguis, blood, and sorbere, to absorb, the plant anciently a styptic.)

Spikes mostly greenish; stigmas cleft into narrow segments (brush-like).
Leaflets incisely pinnatifid; fruiting calyx narrowly 4-winged, smooth on the faces between the angles; annual.....1. *S. annua.*
Leaflets serrate; fruiting calyx broadly 4-winged, irregularly thick-ridged and alveolate on the faces between the angles; perennial.....2. *S. minor.*
Spikes brown-purple; stigmas muricate-papillose; leaflets merely serrate; perennial.....3. *S. officinalis.*

1. **S. ánnua** Nutt. Stem erect, branching at or near the base, 12 to 20 (or 24) in. high; leaflets 3 to 5 lines long, incisely parted into narrow lobes; spike oblong, 4 to 6 (or 10) lines long.—Mts., 2500 to 5000 ft.: Cuyamaca Mts.; Nevada Co. to Modoc Co., thence w. to Humboldt Co.; n. to B. C.



498. Alchemilla arvensis Scop.; *a*, habit x 1; *b*, fl. x 7; *c*, pistil x 6.

2. **S. minor** Scop. Garden Burnet. Similar to no. 1; spikes globose.—Foothills, Howell Mt.; adv. from Eur.

3. **S. officinàlis** L. Great Burnet. Stems 2 to 3 ft. high; leaflets roundish to ovate, cordate or subcordate at base, serrate, 1 to 1¾ in. long; spikes 6 to 11 lines long.—Near the coast, peat bogs: Mendocino Co. to Del Norte Co.; Eur., Asia.

19. **ALCHEMÍLLA** L. Lady's Mantle

Ours a diminutive annual herb, with palmately-lobed leaves and sheathing stipules. Flowers minute, greenish, pediceled and fascicled in the axils. Calyx persistent, its tube pitcher-shaped; limb 4 or 5-parted and bearing an equal number of alternate bractlets, or these minute or obsolete. Petals none. Stamens 1 to 4. Pistils 1 to 4 (in ours 1), distinct, the slender style lateral or arising from near the base. Achene

ovate, smooth, concealed in the tube of the persistent calyx. (So named because valued in alchemy.)

1. **A. arvénsis** (L.) Scop. Fig. 498. One to 3 in. high, the branches slender and flower-bearing throughout; herbage scantily soft hairy; leaves 2 to 3 lines long, fan-shaped, 3-parted, the segments 2 or 3-cleft; calyx ½ to ⅔ line long.—Low hills and plains, common throughout Cal.; nat. from Eur.

20. CERCOCÁRPUS HBK. Mountain Mahogany

Evergreen shrubs or low trees with spur-like branchlets and simple coriaceous straight-veined leaves. Flowers from winter buds, solitary or fascicled, terminal on the short branchlets. Calyx consisting of a slender pedicel-like tube abruptly expanded into the low-hemispherical deciduous 5-toothed limb. Petals none. Stamens numerous, borne in two or three rows on the calyx. Pistil 1. Fruit a villous achene enclosed in the persistent calyx-tube and surmounted by the very much elongated twisted soft-hairy style. (Greek kerkis, a shuttle, and karpos, fruit, in reference to the achene and its twisted tail.)

Flowers solitary or rarely in pairs; sessile; desert ranges.
- Leaves narrowly lanceolate, ½ to 1 in. long ..... 1. *C. ledifolius.*
- Leaves oblong, 2½ to 3 lines long ..... 2. *C. intricatus.*

Flowers in 2 to 15-flowered clusters, shortly pediceled.
- Leaves obovate, cuneate at base; clusters commonly 2 or 3-flowered.
  - Flowers 3 lines broad; cismontane, abundant ..... 3. *C. betuloides.*
  - Flowers 1 to 1½ lines broad; San Diego Co. ..... 4. *C. minutiflorus.*
- Leaves ovate to elliptic; clusters 4 to 9-flowered; Santa Barbara Isls.
  - Leaves glabrous or nearly so ..... 5. *C. alnifolia.*
  - Leaves white-tomentose beneath ..... 6. *C. traskiae.*

1. **C. ledifòlius** Nutt. Desert Mahogany. Mountain Mahogany. Shrub or scraggy tree, usually 6 to 20 or sometimes 40 ft. high; leaves narrowly lanceolate, entire with revolute margins, coriaceous, pale or rusty pubescent below, becoming glabrous and lustrous above, somewhat resinous, ½ to 1 in. long, with a prominent midrib; calyx-tube in fruit 4 to 5 lines long, sessile, tail of the achene 2 to 3 in. long.—Arid slopes of ranges in and bordering the deserts or arid interior, 4000 to 8600 ft.: n. slope San Bernardino Mts. and San Gabriel Mts.; Mt. Pinos; n. along e. side Sierra Nevada to Modoc Co., thence w. to Siskiyou Co.; n. to Wash., e. to Col.

2. **C. intricàtus** Wats. Small-leaf Mahogany. Intricately branched spinescent shrub 2 to 3 ft. high; leaves dark green above, white-pubescent beneath, strongly revolute, the sides nearly meeting over the midrib, 2½ to 3 lines long; tails to the achene ¾ to 1¼ in. long.—Desert ranges, at mostly lower altitudes than no. 1; Inyo Co. (White Mts. and Panamint Range); e. to Utah.

3. **C. betuloides** Nutt. Hard Tack. Fig. 499. Spreading shrub 5 to 8 ft. high, or a small tree up to 22 ft. high; leaves obovate, serrate above the middle, cuneate and entire towards the base, conspicuously feather-veined, dark green above, pale or whitish pubescent beneath, not resinous, ½ to 1 in. long; clusters 2 to 6-flowered; flowers 3 lines broad; calyx strigulose-pubescent; calyx-tube in fruit reddish, 6 lines long, borne on a pedicel 1 to 4 lines long; tail of achenes 2 to 3 (or 4) in. long.—Dry slopes in the foothills

499. Cercocarpus betuloides Nutt.; *a*, fl. branchlet x ½; *b*, long. sect. of fl. x 3; *c*, fr. x ½.

and mts., 500 to 4000 ft., throughout cismontane Cal.; n. to Ore., e. to Rocky Mts., s. to L. Cal. Also called Sweet Brush, Ironwood, and Birch-leaf Mahogany. Apr.-June. Var. MACROÙRUS Jepson n. comb. Leaves 1¼ to 2¼ in. long; calyx tomentulose.—Siskiyou Co. to Modoc Co. (C. macrourus Rydb.) Var. MULTIFLÒRUS Jepson n. var. Leaves 1 to 1½ in. long; flowers 5 to 15 in a cluster.—Santa Catalina Isl. (Avalon, Jepson 3041, type).

4. **C. minutiflòrus** Abrams. Similar to no. 3; leaves elliptic, serrate near the apex, 6 to 10 lines long, glabrous on both sides, green above, yellowish beneath; flowers 1 to 1½ lines broad.—Hills and mesas, se. San Diego Co.; s. to L. Cal.

5. **C. alnifòlia** Rydb. Too like variants of no. 3; shrub or small tree, 8 to 16 ft. high; leaves elliptic, serrate above the base, subglabrate, 1 to 2 in. long; pedicels 3 to 5 lines long.—Santa Catalina and Santa Cruz Isls.

6. **C. tráskiae** Eastw. TRASK MAHOGANY. Shrub or small tree 8 to 20 ft. high; leaves elliptic to sub-orbicular or broadly ovate, serrulate towards apex, mostly obtuse, ⅞ to 2 in. long on petioles 2 to 5 lines long, densely white-woolly beneath, green and minutely pubescent above or at length glabrate, the parallel side-nerves prominent, the margin revolute in age; flowers 4 to 9 in a cluster; calyx densely white-woolly, its tube 4 to 5 lines long, its limb 4 lines broad; pedicels 1 to 3 lines long; tail of achenes 2 to 2¼ in. long.—S. side of Catalina Isl. Remarkable for its very local habitat.

500. Adenostoma fasciculatum H. & A.; *a*, fl. branchlet x 1; *b*, fl. x 4.

21. ADENÓSTOMA H. & A.

Evergreen shrubs with somewhat resinous herbage and heath-like foliage. Leaves fascicled or alternate, linear, rigid, entire, small and numerous. Flowers small (1 to 2 lines long), white, crowded on the branches of a terminal and rather close pyramidal panicle. Calyx obconical, 5-lobed, 10-striate. Stamens 10 to 15, inserted 2 or 3 together, alternate with the broad spreading petals. Pistil 1. Fruit an achene, covered by the indurated calyx-tube. (Greek aden, gland, and stoma, mouth, in allusion to the calyx.)

Leaves fascicled; flowers sessile.....1. *A. fasciculatum.*
Leaves not fascicled; flowers pediceled.....2. *A. sparsifolium.*

1. **A. fasciculàtum** H. & A. CHAMISE. Fig. 500. Spreading shrub 2 to 10 ft. high, with virgate branches clothed with leaf-fascicles; old bark grayish or reddish brown, shreddy; leaves linear or rather broader towards the apex, 3 to 5 lines long; stipules minute; bracts herbaceous, much shorter than the strongly ribbed calyx; ovary obliquely truncate.—Mountain slopes and ridges, 500 to 5000 ft., the most abundant and characteristic bush in the higher foothills of cismontane Cal., commonly gregarious and often forming a distinct zone between the lower foothills and the Yellow Pine belt. June. Var. OBTUSIFÒLIUM Wats. Leaves blunt, 2 to 3 lines long.—San Diego Co.; n. L. Cal.

2. **A. sparsifòlium** Torr. RIBBON WOOD. YERBA DEL PASMO. Shrub of thin and slender habit, 10 to 15 ft. high; old bark red, shredding off freely in thin sheets; foliage-bearing branchlets clustered at the end of the branches; branchlets and leaves glandular-dotted; leaves alternate, linear, 3 to 5 lines long; stipules none; bracts scarious, exceeding the obscurely ribbed calyx; ovary truncate.—Mountain slopes and mesas, 2500 to 6000 ft.: Mt. San Jacinto to San Diego Co.; s. to L. Cal. Aug. Also called Red Shanks.

22. COLEÓGYNE Torr.

Widely, densely, and intricately branched spinescent shrub. Leaves opposite, small, entire, coriaceous. Flowers solitary, terminal on short branchlets and subtended by 1 or 2 pairs of 3-lobed bracts. Calyx 4-parted nearly to base, persistent, the lobes large, yellowish within. Petals none. Stamens many, inserted externally upon the lower part of a tubular sheath or torus which encloses the ovary. Pistil 1; style lateral, conspicuously and densely villous at base, twisted, exserted, persistent. Fruit a coriaceous achene, glabrous. (Greek koleos, sheath, scabbard, and gune, ovary.)

501. Coleogyne ramosissima Torr.; *a*, fl. branchlet x ½; *b*, long. sect. of fl. x 2; *c*, pistil x 4.

1. **C. ramosíssima** Torr. Fig. 501. One to 5 ft. high; leaves fascicled or approximate, thick, linear-oblanceolate, canescent, 2 to 4 lines long; torus membranous, dilated below, 5-toothed at apex, as long as the calyx, densely villous within. — Sandy or gravelly slopes, desert ranges: w. side Colorado Desert; e. Mohave Desert; Inyo Co.; e. to Col.

23. PÚRSHIA DC.

Shrubs. Leaves mostly fascicled, cuneate, 3-toothed or -lobed, with revolute margins. Flowers solitary, terminal on the short branches. Petals clawed, exceeding the calyx-lobes, pale yellow or white. Stamens 18 to 25, in one row. Pistil 1. Fruit a coriaceous oblong pubescent achene, exserted and attenuate into the persistent style. (F. T. Pursh, 1774–1820, author of the Flora Americae Septentrionalis.)

Leaves without punctate glands, apparently deciduous . . . . . 1. *P. tridentata.*
Leaves with punctate glands, apparently evergreen . . . . . 2. *P. glandulosa.*

1. **P. tridentàta** DC. Antelope Brush. Fig. 502. Diffusely branched silvery or gray shrub 1½ to 6 ft. high; bark gray or brown; leaves cuneate, 3-toothed at apex, thinly pubescent and green above, white-pubescent below, 3 to 8 lines long; calyx pubescent, its tube thickly sprinkled with resin granules; petals pale yellow, obovate, 3 to 5 lines long, filmy.—Arid slopes and valleys, 4000 to 7000 ft.: e. slope and e. summit valleys of the Sierra Nevada from Tulare Co. to Modoc Co., thence w. to northern Trinity Co.; n. to Ore., e. to Rocky Mts. Also called Bitter-Brush, Greasewood (Lassen Co.) and Buckbrush (Modoc Co.).

2. **P. glandulòsa** Curran. Dark green shrub 2 to 4 (or 8) ft. high; bark dark red or gray; leaves nearly glabrous, with narrow petiole-like base, divided above into 3 (rarely 5) linear lobes, or sometimes merely 3-toothed, the revolute margin with conspicuous glandular dots or pustules; petals white; calyx and fruit canes-

502. Purshia tridentata DC.; *a*, fl. branchlet x 1; *b*, fr. branchlet x 1.

cent.—Ranges in and bordering the deserts: Mohave Desert; Inyo Co.; s. Mono Co.

24. **OSMARÒNIA** Greene

Shrub with simple entire deciduous leaves and caducous stipules. Flowers dioecious, white, fragrant, in nodding racemes terminating leafy branchlets. Staminate flower with spreading petals; stamens 15, in 3 rows, 10 inserted with the petals, 5 inserted lower down upon the disk lining the calyx-tube. Pistillate flower with erect petals; stamens present but abortive; pistils 5, distinct; styles short, lateral, jointed at base. Fruit consisting of 1 to 5 drupes. Drupes ovoid, 1-seeded, with a thin pulp and bony stone. (Greek, osme, fragrant, and Aronia, a Rosaceous genus proposed by Persoon.)

1. **O. cerasifórmis** (T. & G.) Greene. Oso Berry. Fig. 503. Erect, 3 to 9 ft. high; leaves glabrous, broadly oblong, narrowed to each end, mucronate,

503. Osmaronia cerasiformis Greene; *a*, fl. branchlet x 1; *b*, long. sect. of stam. fl. x 3; *c*, long. sect. of pist. fl. x 3.

1½ to 2½ in. long when mature, short-petioled; petals 2 to 3 lines long; drupes blue-black, 5 to 7 lines long.—North slopes of cañons: near the coast from Santa Lucia Mts. to Humboldt Co., 300 to 1500 ft.; Sierra Nevada from Tulare Co. to Shasta Co., 1500 to 4000 ft. Mar.-Apr. Pulp bitter but not poisonous.

25. **PRÙNUS** L. Plum

Shrubs or small trees. Leaves simple, serrate. Flowers white, in clusters or sometimes solitary, from lateral buds borne on wood of the previous season, appearing before or with the leaves. Calyx 5-cleft, deciduous after flowering. Petals spreading. Stamens 15 to 30. Pistil 1; style terminal; ovules 2, pendulous. Drupe subglobose, usually 1-seeded; flesh sweet or bitter; stone globose or compressed, bony. (The Latin name of the Plum.)

Ovary and drupe glabrous; flowers white, in clusters; style deciduous.
- Drupe subglobose or ovoid, 3 to 8 lines long; leaves folded together lengthwise in bud.—Cherries.
  - Flowers in corymbs; drupe small, bright-red.....1. *P. emarginata.*
  - Flowers in racemes; drupe dark-red.
    - Peduncle leafy; drupe small, its flesh astringent.....2. *P. demissa.*
    - Peduncle leafless; drupe large, its flesh sweetish.....3. *P. ilicifolia.*

Drupe oblong, purplish, ¾ to 1 in. long; leaves rolled up from one edge to the other in bud; flowers in umbels.—PLUMS.....4. *P. subcordata.*
Ovary and drupe velvety-tomentose or pubescent; flowers mostly solitary, sometimes in 2s or 3s; style more or less persistent; leaves folded together lengthwise in bud; all desert species.—ALMONDS and PEACHES.
Leaves narrow.
Flowers pediceled, light rose, 5 to 8 lines broad; leaves glabrous.....
5. *P. andersonii.*
Flowers sessile, white, 2 to 3 lines broad; leaves puberulent....6. *P. fasciculata.*
Leaves broad or roundish, glabrous; flowers white, pediceled.....7. *P. fremontii.*

1. **P. emarginàta** (Dougl.) Walp. BITTER CHERRY. Fig. 504. Deciduous shrub 3 to 8 ft. high, very rarely arboreous and 20 ft. high; bark smooth, dull red; leaves ovate or more commonly oblong-obovate, mostly obtuse, finely serrulate, ¾ to 1½ in. long, on petioles 1 to 3 lines long; blade usually with 1 or 2 glands just above junction with petiole; flowers 6 to 7 lines broad, 3 to 10 in short corymbs; drupes 4 to 5 lines long, bright red, the pulp intensely bitter.—Mountain slopes and along streams: mts. of S. Cal., 5000 to 9000 ft.; Sierra Nevada, 4000 to 8000 ft., forming extensive thickets; Coast Ranges, 500 to 5000 ft., less common; n. to Ida. and B. C. Apr.-May near the coast, June-July in the high mts.

504. Prunus emarginata Walp.; *a*. fl. branchlet x ½; *b*, fl. x ⅔; *c*, fr. cluster x ½.

2. **P. demíssa** (Nutt.) Dietr. WESTERN CHOKE-CHERRY. Fig. 505. Erect slender deciduous shrub 2 to 10 ft. high, or rarely a small tree up to 20 ft. high; leaves oblong-ovate or more commonly oblong-obovate, acute or abruptly short-pointed, finely serrate, 1 to 3½ in. long; petiole ½ in. long, with 1 or 2 glands just below its summit; racemes 2 to 4 in. long, terminating more or less leafy peduncles; flowers 4 to 6 lines broad; drupe red or dark purple, 3½ lines long, astringent.—Mountain slopes and cañons, 1500 to 6700 ft.: mts. of S. Cal.; Sierra Nevada; Coast Ranges; n. to Wash.

505. Prunus demissa Dietr.; *a*, fl. branchlet x ¾; *b*, fl. x 2.

3. **P. ilicifòlia** Walp. ISLAY. Evergreen shrub 4 to 7, or small tree up to 25 ft. high; leaves elliptic or ovate, acute or obtuse, coriaceous, spinose-toothed, 1 to 2 in. long, short-petioled; racemes 1 to 2½ in. long, on axillary leafless peduncles; flowers 2½ to 3½ lines broad; drupe red or dark purple, 6 to 8 lines thick, slightly obcompressed, apiculate; flesh thin, sweetish when ripe.—Mountain slopes and rich valleys, 100 to 4000 ft.: Napa Range to Santa Lucia Mts., Tehachapi Range and S. Cal.; s. to L. Cal. Also called Evergreen Cherry and

Holly-leaf Cherry. Var. INTEGRIFÒLIA Sudw. Often a tree 15 to 45 ft. high; leaves oblong-ovate, usually entire, 3 to 6 in. long.—Santa Barbara Isls.

4. **P. subcordàta** Benth. SIERRA PLUM. Deciduous shrub 4 to 8 ft. high, or a tree up to 20 ft. high, with crooked and rough gray-brown branches and more or less spinescent branchlets; leaves ovate or elliptic to almost round, obtuse or truncate at base, rarely subcordate, serrulate, ¾ to 2 in. long, on petioles 2 to 3 lines long; flowers 6 lines broad, 2 to 4 in a cluster, on pedicels ½ in. long; drupe red, 9 to 11 lines long.—Cañon sides: Sierra Nevada from Tulare Co. to Modoc Co., 2500 to 4500 ft.; Coast Ranges from the Santa Cruz Mts. to Siskiyou Co., 500 to 3500 ft.; n. to Ore. Most abundant and fruiting most freely in ne. Cal. Apr. Var. KELLÓGGII Lem. Drupe larger, yellow, more pulpy, sweeter.—Sierra Co. to Mt. Shasta. Var. RUBICÚNDA Jepson n. var. Two to 4 ft. high; drupe subglobose, bright red, ¾ to 1⅛ in. long; pulp very bitter.—Willow Creek Cañon, Modoc Co. (Goldsmith, type). Var. OREGÀNA Wight. Leaves ovate, abruptly acute, ¾ to 1¼ in. long; drupe dark red, more elliptic than in the species, finely pubescent, ¾ in. long.—Warner Mts., Modoc Co.; n. to southeastern Ore. (P. oregana Greene.)

5. **P. andersònii** Gray. DESERT PEACH. Spreading divaricately branched deciduous shrub 2 to 6 ft. high with very thorny branchlets; leaves fascicled, glabrous, oblong or oblanceolate, minutely serrulate, narrowed to a short petiolar base, 4 to 10 lines long, mostly with several brownish veins; flowers solitary, 5 to 8 lines broad, on pedicels 1½ to 4 lines long; fruits flattened-globose and a little oblique, 6 to 7 lines long, covered with a close dark brown pubescence or indument.—Arid slopes and desert mesas: e. side of Sierra Nevada from Modoc Co. to the Panamint and Coso ranges; nw. Nev. May.

6. **P. fasciculàta** Gray. DESERT ALMOND. Divaricately branched deciduous shrub with gray bark and very thorny branchlets, 2 to 6 ft. high; leaves fascicled, minutely pubescent, narrowly oblanceolate, entire or with 1 or 2 minute teeth on each side, 3 to 8 (or 10) lines long, mostly with one brownish vein; flowers more or less dioecious, solitary or fascicled on the short spurs, sessile or nearly so, 2 to 3 lines broad; fruit ovoid, acutish, light brown with a dense velvet coat of short bristly hairs, 4 to 5 lines long; flesh thin.—Desert slopes and mesas, 3000 to 6500 ft.: Mohave and Colorado deserts and bordering ranges, w. to Santa Barbara and San Luis Obispo Cos., n. to Inyo Co.; e. to Utah and Ariz. Apr.-May.

7. **P. fremóntii** Wats. DESERT APRICOT. Deciduous shrub or small tree, 5 to 15 ft. high with spiny branchlets; leaves ovate or roundish, serrulate, ½ to 1½ in. long, on short slender petioles; flowers solitary or somewhat fascicled, 5 to 6 lines broad, pediceled; fruit oblong-ovoid or elliptic-ovoid, sparingly or minutely puberulent, 4 to 6 lines long.—Ranges in and bordering the Colorado Desert; s. to L. Cal. (P. eriogyna Mason.) Var. PILULÀTA Jepson n. var. Leaves orbicular, more or less truncatish or subcordate at base, 5 to 8 lines long; fruit (immature) subglobose, a little flattened, a little broader than long, 4 lines long.—Wagon Wash near Sentenac Cañon (Jepson 8769, type).

506. Sorbus sitchensis Roem.; fr. branchlet x ¼.

26. SÓRBUS L.

Deciduous trees or shrubs. Leaves pinnate with many leaflets. Flowers white, in compound cymes. Stamens about 20. Ovary inferior, 2 to

5-celled; styles as many as the cells, distinct. Fruit a small berry-like pome. (The Latin name.)

1. **S. sitchénsis** Roem. WESTERN MOUNTAIN ASH. Fig. 506. Many-stemmed erect nearly glabrous shrub 3 to 9 ft. high; leaves 4 to 6 in. long; leaflets 5 to 7 pairs, oblong, serrate except at base, 1 to 2 in. long; corymbs 2 to 3 in. broad; petals 2 lines long; styles villous at base; fruit coral-red, 4 lines long.—Along streams on steep slopes in the mts., 7000 to 9000 ft.: Sierra Nevada from Tulare Co. to Modoc Co., thence w. to Mt. Shasta, Salmon Summit and Marble Mt.; n. to Alas., e. to Lab. Var. DÉNSA Jepson n. var. Leaflets more crowded, 1¼ to 2 in. long; corymbs denser, the pedicels and calyx-tube hairy.—Siskiyou Co. to Mariposa Co. (Stubblefield Cañon, Jepson 4530, type). (Pyrus sambucifolia Bot. Cal.)

27. PHOTÍNIA Lindl.

Evergreen shrub with simple coriaceous serrate leaves. Flowers white, small, numerous, in little cymes disposed in a terminal corymbose panicle. Calyx turbinate, 5-cleft. Petals spreading. Stamens (in ours) 10, in pairs opposite the calyx-teeth; filaments subulate. Pistils 2 or 3, lightly united, only lightly adherent to the fleshy calyx-tube, the thickened calyx-teeth closed over them in fruit. Fruit bright red, ovoid, berry-like. Seeds 1 or 2 in each cell. (Greek photeinos, shining, alluding to the foliage.)

507. Photinia arbutifolia Lindl.; *a*, fl. branchlet x ½; *b*, leaf x ¼; *c*, fl. x 2; *d*, fr. x 1¼.

1. **P. arbutifòlia** Lindl. CHRISTMAS BERRY. TOYON. Fig. 507. Shrub, rarely a small tree, 5 to 15 ft. high; leaves oblong, acute at base and apex, dark green, lighter beneath, 2 to 4 in. long, on petioles ½ to ¾ in. long; panicle in anthesis rather dense, 2 to 3 in. high; corolla 2½ lines broad; fruit 3 to 4 lines long.—Rocky mountain slopes and deep soil of cañon bottoms, 10 to 3500 ft.: Sierra Nevada foothills from Butte Co. to Mariposa Co.; Coast Ranges from Humboldt and Shasta Cos. s. to San Diego Co.; s. to L. Cal. (Heteromeles arbutifolia Roem.) Var. CÉRINA Jepson n. var. Berries yellow.—San Luis Obispo Co. (Templeton, Pearl C. Jared, type) to n. Monterey Co.

28. PÝRUS L. PEAR. APPLE

Deciduous trees or shrubs with simple leaves and stipules which disappear early. Flowers in corymbs. Calyx-tube urnshaped. Petals white or pink, with claws. Stamens about 20. Ovary inferior, 2 to 5-celled, ovules 2 in each cell, the carpels chartaceous; styles as many as the cells, united at base. Fruit a pome. (Latin name of the Pear.)

1. **P. rivulàris** Dougl. OREGON CRAB APPLE. Small tree or many-stemmed shrub 10 to 30 ft. high; leaves ovate, pointed, serrate, or some 3-lobed or with a coarse tooth on each side, green above, pale, pubescent and eventually rusty beneath, 1 to 3¾ in. long; corymbs 4 to 10-flowered; petals white, elliptical, 3 to 5 lines long; carpels commonly 3; fruits oblong or oblong-ovoid, 6 to 7 lines long, yellowish (or pinkish on one side), aging purple-black.—Near the coast: Napa Range and Sonoma Co. to Humboldt Co.; n. to Wash.

29. **CRATAÈGUS** L. Thorn

Thorny shrubs or trees. Leaves simple, toothed or lobed, deciduous. Flowers in ours white, heavy-scented, in short corymbs. Calyx-tube urnshaped. Petals roundish. Stamens 10 to 20. Ovary inferior, or its summit free, 2 to 5-celled, or the 2 to 5 carpels merely contiguous and not united; styles distinct. Fruit more or less drupe-like, red or purple, containing 2 to 5 bony 1-seeded nutlets, these united or separable; calyx-teeth persistent. (Greek kratos, strength, in reference to the wood.)

1. **C. douglásii** Lindl. Western Black Haw. Much branched shrub 5 to 9 ft. high or sometimes a scraggly tree up to 20 or 30 ft. high; thorns stout, ½ to 1 in. long; twigs reddish; leaves obovate or ovate, doubly serrate above the cuneate entire base and often lobed or rarely with 1 or 2 deep slashes, 1 to 2 (or 4) in. long, on short petioles; flowers 5 to 6 lines broad; fruit black, 5 to 6 lines long.—Cañon flats, 2500 to 4000 ft., Sonoma Co. to Humboldt Co., thence e. to Modoc Co.; n. to B. C., e. to Mich. June. (C. rivularis Fl. W. Mid. Cal.)

30. **PERAPHÝLLUM** Nutt.

Low shrub. Leaves simple, mostly fascicled at the ends of the branchlets or short spurs. Flowers appearing with the leaves, solitary or in a sessile 2 to 3-flowered umbel. Ovary inferior, 2-celled, each cell becoming incompletely divided by a false partition; styles 2. Fruit globose, fleshy. (Greek pera, excessively, and phullon, a leaf.)

1. **P. ramosíssimum** Nutt. Intricately branched, 2 to 4 ft. high, with short rigid branchlets and grayish bark; leaves oblanceolate, entire or very minutely serrate, ½ to 1¼ (or 2¼) in. long; flowers pale rose-color; petals roundish-obovate, spreading, 4 lines long; fruit yellowish, 4 to 5 lines in diameter.—High interior plateau, Lassen Co. to ne. Shasta Co. and Modoc Co.; n. to Ore., e. to Rocky Mts. May.

31. **AMELÁNCHIER** Medic. June Berry

Shrubs or small trees with simple deciduous leaves. Flowers white, in racemes. Calyx-tube campanulate, more or less adnate to the ovary, the limb 5-parted, the lobes narrow, persistent. Petals ascending. Stamens indefinite, about 20, the outer row with longer filaments. Ovary partly or wholly inferior, 5-celled, each cell in fruit divided into 2 by a partition from the back; styles 5, united below. Fruit berry-like, globose, the cells 1-seeded. (Savoy name of the Medlar.)

1. **A. alnifòlia** Nutt. Western Service Berry. Fig. 508. Shrub 3 to 12 ft. high; leaves mostly elliptic, sharply serrate near the apex or less commonly entire, ¾ to 1¼ in. long; petioles 4 to 6 lines long; racemes short and rather dense; petals narrowly oblong, or somewhat cuneate at base, 4 to 6 lines long; calyx tomentulose or white-hairy, more or less glabrate; fruit purplish, 2½ to 3 lines in diameter.—Mountain slopes: High mts. of S. Cal. and Sierra Nevada, 5000 to 8000 ft.; Coast Ranges, 100 to 6000 ft.; n. to Alas., e. to Rocky Mts. Variable as to pubescence, especially of flowering parts. The following are shadowy or wavering varieties only tentatively entered here: Var. pállida Jepson n. comb. Leaves cuspidate, entire or less serrate at apex; calyx-lobes subglabrous outside.—Usually at lower and more arid situations:

508. Amelanchier alnifolia Nutt.; fl. branchlet x 1.

Sierra Nevada and Coast Ranges to mts. of S. Cal. (A. pallida Greene). Var. VENULÒSA Jepson n. comb. Leaves conspicuously veiny, serrate at apex or above middle; calyx pubescent outside.—Arid mountain slopes: Warner Mts.; San Gabriel Mts.; San Bernardino Mts. (A. venulosa Greene.) Var. COVÍLLEI Jepson n. comb. Leaves obtuse, pointed at very apex; petals 2½ to 3 lines long.—Panamint Mts. (A. covillei Sta.)

LEGUMINÒSAE. Pea Family

Herbs, shrubs, or trees. Leaves alternate, stipulate, usually compound. Leaflets 1 to many, usually entire. Calyx synsepalous, 5-toothed or -cleft (or in Lupinus 2-lipped), mostly persistent. Corolla with 5 petals, regular or somewhat irregular or in ours commonly papilionaceous, i. e., highly irregular and butterfly-like: the upper petal is called the banner; the lateral petals are called the wings; the two lower petals are joined by their edges to form the keel; the banner in the bud enfolds the wings which in turn cover the keel-petals; all the claws are free from one another. Petals essentially hypogynous. Stamens 10, united into a sheath around the ovary (monadelphous), or the upper stamen distinct from the others (diadelphous), or sometimes all distinct. Pistil 1, superior, 1-celled. Fruit a legume (2-valved pod), with 1 row of seeds on the ventral side, commonly opening by both the dorsal and ventral sutures, the valves twisting in opposite directions, or sometimes indehiscent. Seeds mostly kidney-shaped, without endosperm.—Amorpha has but one petal. Krameria has simple leaves without stipules, 4 stamens and an irregular corolla. Acacia has numerous stamens. In ours Cytisus and Ulex have no stipules. The seeds of Cassia have endosperm. The pod in Astragalus is sometimes 2-celled.

A. COROLLA REGULAR, OR ONLY SLIGHTLY IRREGULAR (EXCEPT IN NO. 2), NOT AT ALL PAPILIONACEOUS (OBSCURELY SO IN NO. 1); TREES OR SHRUBS.

Leaves simple.
- Pods not spiny; stamens 10 ..... 1. CERCIS.
- Pods spiny; stamens 4 ..... 2. KRAMERIA.

Leaves compound.
- Calyx with perigynous disk within the tube or at base.
  - Leaves simply pinnate; anthers fixed by the base; fertile stamens 7 ..... 3. CASSIA.
  - Leaves bipinnate, the petiole very short or almost none, bearing one pair of pinnae; calyx 5-lobed, the lobes reflexed at maturity, deciduous; stamens 10, distinct; anthers fixed by the middle; corolla moderately large (2 to 5 lines long).
    - Pods flattish; petiole not spinescent at tip ..... 4. CERCIDIUM.
    - Pods torulose; petiole spinescent at tip ..... 5. PARKINSONIA.
- Calyx without perigynous disk; corolla minute (1 to 1½ lines long); leaves usually twice pinnate.
  - Petals distinct or becoming so; stamens 10 ..... 6. PROSOPIS.
  - Petals united below; stamens indefinitely numerous ..... 7. ACACIA.

B. COROLLA PAPILIONACEOUS.

1. Stamens distinct.

Leaves palmately 3-foliolate.
- Flowers yellow, in racemes; stipules conspicuous; herbs ..... 8. THERMOPSIS.
- Flowers purple, solitary; stipules none; very spiny shrub ..... 9. PICKERINGIA.

Leaves bipinnate; herbs or low shrubs with racemes of yellow flowers ..... 10. HOFFMANSEGGIA.

2. Stamens diadelphous or monadelphous.

a. Calyx deeply 2-lipped; stamens 5 long and 5 short, their filaments monadelphous but free at apex; anthers alternately larger and smaller.

Sides of the roundish banner turned or rolled sharply backwards; flowers mostly blue or purple, rarely white, yellow or red, in terminal racemes, mostly in whorls; leaves palmate, of 4 to many leaflets; seeds without strophiole ..... 11. LUPINUS.

Sides of banner not rolled or bent backward; flowers yellow; seeds with strophiole; introduced shrubs.
- Leaves 3-foliolate, or the branches leafless; calyx herbaceous, divided half-way into 2 lips ..... 12. CYTISUS.
- Leaves simple, or the branches leafless; calyx membranous, divided nearly to base into 2 lips ..... 13. ULEX.

b Calyx not deeply 2-lipped.

Leaves compound.
- Leaves 3-foliolate, the leaflets denticulate or serrulate; (see also nos. 17 and 20).
  - Flowers in a raceme or spike; corolla deciduous after flowering; leaves pinnately 3-foliolate.
    - Pod curved or spirally coiled; style subulate ..... 14. MEDICAGO
    - Pod small, ovoid; style filiform ..... 15. MELILOTUS

Flowers in a head, rarely in a capitate umbel or short spike; corolla withering-persistent after flowering; leaves palmately 3, sometimes 4 or 5-foliolate. 16. TRIFOLIUM.
Leaves pinnate, the leaflets commonly entire.
Leaves commonly odd-pinnate (two species palmate in Psoralea), the leaflets entire.
Flowers in umbels, sometimes solitary; leaflets commonly 3 to many, sometimes 1 or 2.....17. LOTUS.
Flowers in racemes or spikes; leaflets many (few in no. 20 and often in no. 19).
Herbage glutinous or glandular-dotted.
Pod not prickly; flowers purple or whitish or rose-color.
Corolla of 1 petal; shrub.....18. AMORPHA.
Corolla of 5 petals.
Shrubs, sometimes herbs; deserts.....19. PAROSELA.
Herbs; Sierra Nevada and Coast Ranges..20. PSORALEA.
Pod prickly, indehiscent; flowers yellowish.....21. GLYCYRRHIZA.
Herbage not glandular-punctate nor glutinous (viscid in 1 species of no. 24); herbs.
Leaves and upper stipules spinose-tipped.....22. KENTROPHYTA.
Herbage unarmed.
Tip of keel obtuse or merely acute.....23. ASTRAGALUS.
Tip of keel prolonged into a distinct beak.....24. OXYTROPIS.
Leaves equally pinnate.
Tree, spinescent; two upper calyx-teeth united.....25. OLNEYA.
Herbs.
Rachis not produced into a tendril; pods somewhat stipitate, septate between the seeds.....26. SESBANIA.
Rachis produced into a branched tendril, rarely terminating in a bristle or imperfect leaflet; pods not septate between the seeds; flowers commonly in spikes or racemes.
Style hairy all around at summit.....27. VICIA.
Style hairy on the upper side.....28. LATHYRUS.
Leaves simple; very spiny low shrub.....29. ALHAGI.

1. **CÉRCIS** L. JUDAS TREE

Shrubs. Flowers red-purple, in umbel-like fascicles, appearing from winter buds in advance of the simple leaves. Stipules caducous. Calyx in anthesis broader than long, with 5 broad obtuse teeth. Corolla obscurely papilionaceous; banner smaller than the wings and enclosed by them in the bud; keel-petals larger than the wing-petals and not united. Stamens 10, distinct, declined, the filaments clavate-dilated towards the base. Pod oblong, very flat, the upper suture with a winged margin. Embryo straight. (Kerkis, Greek name of the oriental Judas Tree.)

1. **C. occidentàlis** Torr. WESTERN RED-BUD. Fig. 509. Stems usually clustered, 8 to 15 ft. high; leaves round, cordate at base with nearly closed sinus, 2½ to 3½ in. broad; pod 2 to 2½ in. long and 8 lines wide.—Foothills, 1000 to 4000 ft.; inner North Coast Ranges from Solano Co. to e. Mendocino Co. and Shasta Co., s. through the Sierra Foothills to Tulare Co. and the mts. of S. Cal.; e. to Tex. Mar.-Apr.

509. Cercis occidentalis Torr.; *a*, fl. branchlet x ½; *b*, fl. x 1; *c*, pod x ½.

2. **KRAMÈRIA** L.

More or less root-parasitic shrubs with alternate simple entire leaves without stipules. Flowers purple, solitary in the axils on bracted peduncles. Sepals 5, petal-like, the lower one broadest. Petals 5, smaller than the sepals, the 3 upper parallel and approximate with very small blades and very long claws, the 2 lower reduced to short fleshy scales. Stamens 4, all on upper side of

510. Krameria canescens Gray; *a*, fl. branchlet x ½; *b*, fl. x 1; *c*, fr. x 1.

flower, in two unequal pairs; anthers opening by a terminal pore. Ovary 2-ovuled. Pod subglobose, spiny, indehiscent, 1-seeded. (J. G. H. Kramer, Austrian army physician, 18th century, author of a key to the herbs, shrubs and trees.)

Spines on fruit barbed at apex..... 1. *K. canescens.*
Spines on fruit barbed their whole length... 2. *K. parvifolia.*

1. **K. canéscens** Gray. Fig. 510. Intricately and densely branched thorny shrub 1½ to 2¼ ft. high; young parts tomentose; leaves lanceolate or linear, acute, 2 to 5 lines long; peduncles bearing near middle one pair of opposite bracts; calyx 4 to 5 lines long, lightly tomentose without, deep purple within; upper sepals approximate, erect or recurving, lateral pair upwardly curving with falcate tips, the lower one spreading downward; petals red-purple with yellowish claws; style with a white-pubescent zone at base; pod globose, 4 lines long, armed with many slender (2 lines long) spines barbed at tip.—Mohave and Colorado deserts; e. to N. Mex., s. to Mex. and L. Cal. (K. grayi Rose & Painter.)

2. **K. parvifòlia** Benth. Similar to no. 1; peduncles bearing 2 or 3 opposite pairs of leaf-like bracts.—Mohave Desert; s. along the western borders of the Colorado Desert to L. Cal.; e. to N. Mex.

3. CÁSSIA L. Senna

Herbs or shrubs with even-pinnate leaves. Flowers (in ours) yellow, in racemes. Sepals 5, distinct or nearly so. Corolla regular, with spreading petals. Fertile stamens (in ours) 7, the anthers opening by 2 pores at the apex, the 3 remaining stamens represented by short sterile filaments on the upper side of the flower. Pod usually curved, many-seeded. (Ancient Greek name.)

Herbage glabrous or nearly so; stipules and stipels none; racemes terminal.....1. *C. armata.*
Herbage finely and densely white-pubescent; stipules and stipels filiform; racemes axillary.....2. *C. covesii.*

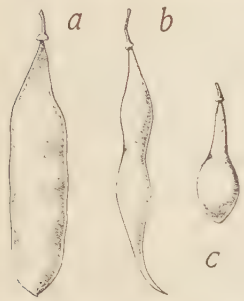
1. **C. armàta** Wats. Fig. 511. Much-branched bush 2 to 4 ft. high; shoots of the season thickish, green, almost leafless, ending in racemes 3 to 7 in. long; leaf-rachis elongated, dilated, ending in a conspicuous point, bearing 1 to 4 pairs of leaflets; leaflets distant, oblong or ovate, 2 to 4 lines long; petals roundish, bright salmon-color, 4 to 6 lines long; pods curved.—Sandy shallow washes: Colorado and Mohave deserts and n. to Inyo Co.; e. to western Ariz.

2. **C. còvesii** Gray. Bush 1 to 2 ft. high; leaf-rachis short, bearing 3 pairs leaflets; leaflets elliptic, 6 to 12 lines long; racemes few-flowered, corymbose, 1 to 2 in. long; petals oblong-obovate, veined, 6 lines long; pods straight.—Sandy washes, Chuckawalla Mts., Colorado Desert; e. to Ariz.

511. Cassia armata Wats.; *a*, fl. branchlet; *b*, leaf; *c*, pod. x ⅓.

4. CERCÍDIUM Tul.

Shrubs or small trees, armed with short axillary thorns. Leaves bipinnate with very short petiole bearing one pair of pinnae, each pinna with 2 or 3 equal pairs of leaflets. Flowers on jointed pedicels in axillary racemes. Petals yellow, clawed, the upper one broader than the rest, a little auricled at base of blade, and with longer claw. Stamens 10, distinct, the filaments hairy at base. Pod linear or oblong, flattish. (Greek cercidion, a weaver's shuttle, in reference to the fruit.)



512. Cercidium torreyanum Sarg.; *a*, *b*, *c*, different forms of pods x ½.

1. **C. torreyànum** (Wats.) Sarg. PALO VERDE. Fig. 512. Tree 15 to 20 ft. high, with short trunk and smooth green bark, leafless for most of the year; flowers yellow, 6 to 9 lines broad; pods 2 to 3 in. long, often conspicuously constricted between the flat seeds.—Sandy washes or depressions in the Colorado Desert; s. Ariz. to L. Cal. and Sonora. The leaves fall soon after they appear in March, but the tree still presents a cheerful appearance on account of its bright green bark.

5. PARKINSÒNIA L.

Shrubs or low trees. Leaves bipinnate, the common petiole very short, or almost none, bearing one pair of pinnae, each pinna with 4 to 25 pairs of leaflets. Flowers in loose racemes. Petals yellow. Stamens 10, distinct, in 2 rows, the filaments hairy below. Pod linear-cylindric, conspicuously constricted between the seeds. (James Parkinson, 1567-1650, author of botanical treatises and herbalist to James I.)

1. **P. microphýlla** Torr. MALE PALO VERDE. Shrub 5 to 10 ft. high or a small tree up to 25 ft. high, with light green bark; branchlets spinose at tip; pinnae ½ to 1 in. long, in sessile pairs, the common petiole short or none; leaflets 4 to 8 pairs, elliptic, ½ to 1 line long; petals pale yellow, 2 to 2½ lines long; pods 1½ to 3 in. long, 1 to 3-seeded, strongly constricted between the seeds and the constrictions sometimes elongated, beaked with a long-acuminate apex and contracted at base into a cuneate stipe.—Whipple Mts. on the Colorado River; Ariz.; n. Mex.

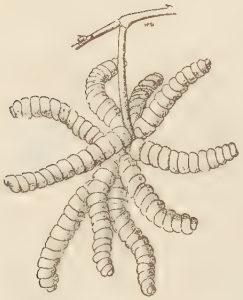
6. PROSÒPIS L.

Deciduous shrubs or trees, the branches armed with spines or thorns. Leaves deciduous, bipinnate with 1 pair (rarely 2 pairs) of pinnae; leaflets in equal pairs, numerous, small, entire. Flowers small, greenish-yellow, regular, sessile, in axillary pedunculate cylindrical spikes. Calyx campanulate, with 5 short teeth, deciduous. Petals 5, very much exceeding the calyx. Stamens 10, distinct, exserted. Ovary stipitate, villous. Pod straight, curved or coiled, indehiscent, the many seeds separated by thick spongy partitions. (Greek prosopis, ancient name for the butter-bur.)

Pinnae with 10 to 15 pairs of leaflets; thorns axillary, in pairs, singly or none; pod straight or curving, compressed.....1. *P. juliflora.*
Pinnae with 5 to 8 pairs of leaflets; spines in pairs, stipular; pod spirally coiled into a straight cylindric body...
2. *P. pubescens.*

1. **P. juliflòra** DC. var. **glandulòsa** Ckll. HONEY MESQUITE. Fig. 513. Several-stemmed or a short-trunked tree with crooked or arching branches forming a rounded or depressed crown, 10 to 20 ft. high; leaflets linear, ½ to 1 in. long; stipules linear and membranous; thorns 1 or 2, axillary, ¼ to 1¼ in. long, or sometimes absent; flowers 2 lines long, condensed in slender cylindrical spikes mostly 2 to 3½ in. long; stamens twice as long as the petals; pods borne in drooping clusters, 1 to 6 to each spike,

513. Prosopis juliflora var. glandulosa Ckll.; fl. branchlet x ⅓.



514. Prosopis pubescens Benth.; fr. spike x ½.

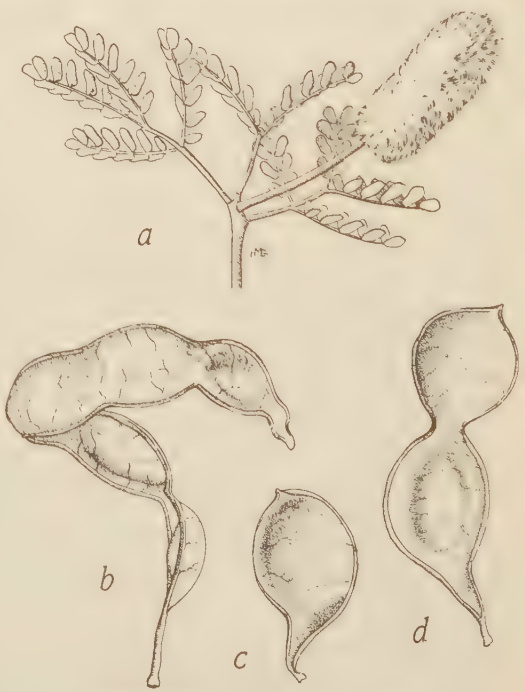
linear, at first flat, later becoming thickened, curved 4 to 8 in. long, 4 to 5 lines broad, irregularly constricted between the seeds which are about 3 lines long.—Colorado and Mohave deserts; local in the upper San Joaquin Valley, at San Jacinto Lake and in w. San Diego Co.; e. to Tex., s. to northern Mex.

2. **P. pubéscens** Benth. SCREW-BEAN MESQUITE. Fig. 514. Shrub or small tree 10 to 35 ft. high; branches armed with stout stipular often whitish spines 2 to 6 lines long; leaves canescently puberulent; leaflets oblong, 1 to 5 lines long; flowers 2 lines long, borne in spikes 2 to 3 in. long, each spike setting 2 to 15 pods; pod coiled into a narrow straight cylindric body 1 to 1½ in. long; seeds less than 1 line long.—Sandy or gravelly washes or ravines: Colorado and Mohave deserts, n. to Death Valley; e. to N. Mex.

7. ACÀCIA Willd.

Trees or shrubs with bipinnate leaves and small leaflets. Flowers minute, in ours yellow, perfect or polygamous, condensed in pedunculate cylindrical or globular spikes. Spikes solitary or fascicled in the axils or disposed in a diffuse terminal panicle. Calyx 4 or 5-toothed. Petals more or less united below. Stamens numerous, distinct or nearly so, much exserted. Pod 2-valved or indehiscent. (Greek akakie, from ake, a point, referring to the prickles.)

1. **A. gréggii** Gray. CATCLAW. Fig. 515. Straggling shrub 4 to 7 ft. high, or sometimes becoming a small tree up to 15 ft. high; branches armed with scattered short but stout curved prickles, rarely unarmed; leaves deciduous, 1 to 2 in. long, with 1 or mostly 2 or 3 pairs of pinnae and 4 to 6 pairs of pale leaflets; leaflets oblong to oblong-obovate, 1 to 3½ lines long; flowers in cylindrical spikes ¾ to 2¼ in. long; pods 2 to 11-seeded, much compressed, more or less constricted between the seeds and curved or contorted, narrowed to a cuneate base, 2 to 6 in. long, or sometimes much reduced, 1-seeded and simulating a fry-pan in outline.—Washes or hillsides in the Colorado Desert, n. to the Providence Mts.; e. to Tex., s. to Mex.



515. Acacia greggii Gray; *a*, fl. branchlet; *b*, *c*, *d*, different forms of pods. x 1.

8. THERMÓPSIS R. Br.

Perennial herbs (resembling Lupines) with commonly erect clustered stems. Leaves palmately 3-foliolate, petioled, and with free leaf-like stipules. Flowers yellow, in a terminal raceme, the pedicels subtended by persistent bracts. Calyx campanulate, deeply toothed, the

two upper teeth in ours almost completely united. Banner roundish, shorter than the oblong wings, the sides reflexed; keel nearly straight, obtuse, its petals very lightly joined, equaling the wings. Stamens distinct. Pod long, linear, flat, several-seeded. (Greek thermos, lupine, and opsis, resemblance.)

Herbage glabrous; pedicels equaling or longer than bracts.....1. *T. gracilis.*
Herbage densely pubescent or tomentose; pedicels commonly shorter than bracts.....
2. *T. macrophylla.*

1. **T. grácilis** Howell var. **venòsa** Jepson n. comb. Stems branching, 1½ ft. high; herbage glabrous; leaflets obovate to oblong, 1¼ to 2 in. long; stipules ovate or oblong, obtuse or acutish, longer or shorter than the petioles; racemes loose, the flowers solitary or in 2s in the axils of the bracts; pedicels equaling or longer than the bracts; pods linear, 2 to 3 in. long, on a stipe shorter than the calyx. —Trinity and Shasta Cos. May. (T. venosa Eastw.) Var. VELÙTINA Jepson n. comb. Leaflets small, with a dense velvety pubescence. — Mt. Hamilton Range to S. Cal. (T. velutina Greene.) Var. ARGENTÀTA Jepson n. comb. One to 2 ft. high, densely silky-pubescent throughout.—Shasta and Modoc Cos. (T. argentata Greene.)

2. **T. macrophýlla** H. & A. Fig. 516. Stems somewhat branched above, 1 to 2 ft. high; leaves silky or whitish-pubescent when young, soon glabrate, at least above; leaflets broadly or narrowly obovate and often more or less rhomboidal, acute at each end, or some obtuse at apex (even on same plant), 1½ to 3 or 4 in. long; stipules strongly oblique or not at all oblique, even on the same plant, longer than the petioles; upper lip of calyx slightly notched; lower calyx-teeth shorter than or as long as tube; raceme rather dense, 3 to 6 in. long; pods straight, silky, 2 to 5-seeded.—Coast Ranges, mostly toward the coast, from Monterey Co. to Mendocino Co.

516. Thermopsis macrophylla H. & A.; *a*, leaves and raceme x ⅓; *b*, fl. x 1; *c*, fl. with corolla removed x 1.

9. PICKERÍNGIA Nutt.

Very rigid and spiny evergreen xerophytic shrub. Leaves small, palmately 1 to 3-foliolate, nearly sessile and without stipules. Flowers large, purple, solitary, axillary and short-pediceled. Calyx campanulate with a turbinate base, the border with 5 very low broad teeth. Petals equal, the banner orbicular with reflexed sides, the wing- and keel-petals oblong, the latter distinct and straight. Stamens distinct. Pod linear, flat, stipitate, straight, several-seeded. (Charles Pickering of the Wilkes Expedition, which visited California in 1841.)

1. **P. montàna** Nutt. PEA CHAPARRAL. Fig. 517. Densely branched shrub, 3 to 8 ft. high, the branchlets very spinose; leaflets obovate, entire, 2 to 6 lines long; flowers near the ends of the branchlets, rose-purple, ¾ in. long, on very short pedicels; pedicels bearing 2 minute subulate bractlets near the middle; banner with a yellowish or whitish spot at base; stamens persistent; pod exserted on the stipe, about 2 in. long, 6 to 10-seeded, somewhat constricted between the seeds.—Characteristic chaparral shrub, 2000 to 5000 ft.: San Diego Co. and n. to Mendocino Co.; Sierra Nevada from Nevada Co. to Butte Co. May-June. The roots, as in this family generally, bear

517. Pickeringia montana Nutt.; *a*, fl. branchlet x ⅔; *b*, fl. x 1.

nodules, but in this species in very large clusters, resembling those on the roots of Ceanothus thrysiflorus.

10. HOFFMANSÉGGIA Cav.

Herbs or low shrubs, the stems from tuberous roots or a woody base. Leaves bipinnate, glandular-dotted, with very small leaflets and small stipules. Flowers and fruit more or less glandular. Flowers yellow, in naked racemes. Calyx 5-parted, the lobes nearly equal. Petals and stamens perigynous, inserted at the summit of the short calyx-tube. Petals 5, obovate, oval or oblong, nearly equal. Stamens 10, distinct. Ovary subsessile. Pod flat, with few or several seeds. (J. Centurius, Count of Hoffmansegg, 1766–1849, author, with J. F. Link, of a Flora of Portugal.)

Herb; leaves with several pair of pinnae.....1. *H. densiflora.*
Shrub; leaves with only one pair of pinnae besides the terminal pinna..2. *H. microphylla.*

1. **H. densiflòra** Benth. CAMOTE DE RATON. Stems several from deep-seated roots, 8 to 12 in. high, with a heavy tuft of mostly basal leaves; leaves bipinnate, 3 to 5 in. long, commonly 3 to 5 pairs, the pinnae 3 to 9 lines long, leaflets oblong, 1 to 3 lines long; flowers 5 lines long; corolla orange-red; lower margins of petals and claws with many stipitate glands; filaments puberulent, the alternate ones less heavy or glandular than the others; ovary densely covered with tack-shaped glands; pods 1½ in. long, straight on the ventral suture.—Hard alkaline spots: Inyo Co.; head of the San Joaquin Valley; Mohave and Colorado Deserts; s. to L. Cal. and Mex., e. to Tex. Apr.-June.

2. **H. microphýlla** Torr. Bush 2 to 10 ft. high, with rush-like stems; leaves ¾ to 1¼ in. long, with one pair of lateral pinnae 2 to 5 lines long, the terminal pinna twice as long; racemes 4 to 5 in. long; flowers 4 lines long; filaments woolly at base; ovary with its margins and style densely hairy; pods oblong, 8 to 9 lines long.—Colorado Desert; s. to L. Cal.

11. LUPÌNUS L. LUPINE

By CHARLES PIPER SMITH

Herbs or shrubs. Leaves palmately compound, rarely unifoliolate; petioles dilated at base; leaflets usually 3 to 17. Flowers racemose. Calyx 2-lipped, the lips entire, toothed, or the upper bifid, often with bractlets between the lips. Banner commonly with a ventral median sulcus, a pair of rounded umbos, the sides reflexed, the back glabrous or more or less pubescent; wings usually glabrous, rarely pubescent on the side or somewhat ciliate on the edges near the claw; keel often ciliate on the free margins. Stamens 10,

monadelphous, the anthers alternately of two forms. Legume flattened. Ovules 2 to 12. Seeds with a sunken hilum. Cotyledons thick and fleshy. (Latin lupus, a wolf, these plants thought to rob the soil of its fertility.)

A. Cotyledons sessile, connate; ovules usually 2 only; annuals.

1. Flowers non-verticillate; keel non-ciliate.

Pods lance-oblong, hirsute, constricted between the seeds; stems and peduncles both very short, the racemes equaled or surpassed by the foliage; seeds concave-lenticular. . 1. *L. pusillus.*
Pods oblong or ovate, scarcely constricted between the seeds; peduncles well-developed; seeds more or less oblong.
Pods oblong, about 20 mm. long, smooth or scaly on the sides; ovules 2 to 6; flowers 10 mm. long. . . . . 2. *L. odoratus.*
Pods ovate, or not over 15 mm. long; ovules two.
Banner suborbicular; racemes elongated; pods loosely villous on the sides. . . . . 3. *L. rubens.*
Banner longer than wide.
Stems and petioles densely short- and spreading-pubescent; racemes elongated; pods smooth or scaly on the sides. . . . . 4. *L. shockleyi.*
Stems and petioles densely villous; racemes usually subcapitate; pods loosely villous on the sides. . . . . 5. *L. brevicaulis.*

2. Flowers verticillate; keel ciliate on the upper margins near claws.

Flowers ascending to suberect in anthesis.
Banner 7 to 11 mm. wide, rounded at apex; both wing and keel petals ciliate near claws on both upper and lower margins. . . . . 6. *L. horizontalis.*
Banner 4 to 6 mm. wide, angled at apex; neither wing nor keel petals ciliate on lower margins. . . . . 7. *L. microcarpus.*
Flowers spreading in anthesis.
Flowers becoming suberect soon after anthesis, usually not secund. . . . 8. *L. subvexus.*
Flowers spreading or distinctly secund after anthesis.
Stems often fistulose; banner elliptic or oval, rarely ovate; keel sparsely ciliate or non-ciliate below; seeds smooth or roughened, but not tuberculate. . 9. *L. densiflorus.*
Stems never fistulose; banner ovate; keel densely ciliate below; seeds uniformly dark brown and tuberculate. . . . . 10. *L. luteolus.*

B. Cotyledons petioled after germination; ovules 2 to 12 or more.

I. Plants annual or biennial.

1. Flowers verticillate.

Keel ciliate on both upper and lower margins, near the claws only. . . . . 11. *L. succulentus.*
Keel non-ciliate, or ciliate on upper margins near apex only.
Pedicels 3 to 8 mm. long; flowers 8 to 16 mm. long; banner suborbicular or wider than long; verticils four to several. . . . . 12. *L. nanus.*
Pedicels 1 to 3 mm. long.
Banner cuneate or spatulate; keel short and broad, the blunt acumen scarcely upturned. . . . . 15. *L. micranthus.*
Banner neither cuneate nor spatulate; keel slender, with long narrow acumen, often much upturned.
Pods 6 to 9 mm. wide; seeds 4 to 5 mm. long by fully 3 mm. wide. . . . . 13. *L. pachylobus.*
Pods 3 to 5 mm. wide; seeds 2 to 3 mm. long by about 2 mm. wide. . . . . 14. *L. bicolor.*

2. Flowers non-verticillate.

Keel non-ciliate. . . . . 16. *L. concinnus.*
Keel ciliate on the lower free margins near claws, often also on the upper margins.
Racemes usually shorter than their peduncles. . . . . 23. *L. stiversi.*
Racemes longer than their peduncles.
Largest leaflets 15 to 25 mm. wide; whole plant with stinging hairs 2 to 5 mm. long. . . . . 17. *L. hirsutissimus.*
Largest leaflets 2 to 12 mm. wide; longest hairs not over 2 mm. long.
Keel stout, with blunt, short acumen, densely woolly-ciliate on the upper edges. . . . . 18. *L. truncatus.*
Keel with slender acute acumen.
Matured pods ascending; petals blue, lilac or purple.
Pedicels 5 to 10 mm. long; floral bracts much exceeding the buds, usually early deciduous. . . . . 19. *L. benthami.*
Pedicels 2 to 4 mm. long; bracts not much exceeding the buds, often subpersistent. . . . . 20. *L. sparsiflorus.*
Matured pods deflexed; petals not at all blue.
Plants 1 to 2 dm. tall; petals orange or golden; ovules 3 to 4. . . . 21. *L. citrinus.*
Plants 2 to 4 dm. tall; petals white or pinkish; ovules 5 to 8. . . . 22. *L. deflexus.*

II. PLANTS PERENNIAL.

1. Pedicels short and stout, usually less than 3 mm. long; floral bracts usually persistent or tardily deciduous; racemes subspicate with flowers usually crowded; keel ciliate.

Banner pubescent on the back.
Pubescence all appressed or subappressed....31. *L. canescens.*
Stems and petioles usually densely villous, at least with some widely-spreading hairs..
30. *L. leucophyllus.*

Banner glabrous.
Largest leaves cauline, short-petioled.
Pubescence minute and closely appressed except in the inflorescence; peduncles elongated, surpassing the uppermost foliage; bracts and bractlets lanceolate....28. *L. pratensis.*
Pubescence long and loose, largely spreading; peduncles short, not surpassing the uppermost foliage; bracts and bractlets linear or filiform....
29. *L. covillei.*

Largest leaves long-petioled, usually basal.
Racemes capitate or subcapitate, rarely more than twice as long as wide; peduncles usually curved or bent, spreading or decumbent; stems often woody near base....24. *L. lyallii.*
Racemes cylindric or conoidal, usually more than twice as long as wide.
Banner suborbicular; peduncles shorter than the elongated, leafy stems....
27. *L. hypolasius.*

Banner longer than wide.
Flowers 6 to 9 mm. long....25. *L. torreyi.*
Flowers 10 to 13 mm. long....26. *L. confertus.*

2. Pedicels slender, usually 3 to 12 mm. long; floral bracts usually early deciduous.

a. Apex of banner normally not much reflexed from upper margin of wings; ventral median sulcus of banner deep, covering considerable of the wings.

Plants less than 15 cm. tall, commonly shrubby and matted....32. *L. breweri.*
Plants over 15 cm. tall.
Flowers 6 to 8 mm. long....33. *L. meionanthus.*
Flowers 8 to 14 mm. long.
Keel non-ciliate....47. *L. adsurgens.*
Keel more or less ciliate on the upper edges.
Wing petals rather densely pubescent on outer surface near upper distal corner; calyx-cup spurred....34. *L. laxiflorus.*
Wing petals not pubescent near upper distal corner, though sometimes with a few scattered villi near the claws.
Leaflets glabrous or glabrate above.
Stems without long-petioled lower leaves at flowering time, much branched above....40. *L. corymbosus.*
Stems with some long-petioled lower leaves at flowering time.
Leaflets linear-falcate, about 2 mm. wide; keel curved....
35. *L. gracilentus.*
Leaflets oblanceolate, usually over 6 mm. wide; keel nearly straight....36. *L. onustus.*
Leaflets permanently pubescent above.
Calyx-cup scarcely gibbous; pubescence largely spreading....
37. *L. ludovicianus.*
Calyx-cup spurred or strongly gibbous.
Stems with some long-petioled lower leaves at flowering time; pubescence of pedicels appressed or subappressed..
38. *L. caudatus.*
Stems without long-petioled lower leaves at flowering time; pubescence of pedicels widely spreading....
39. *L. invoensis.*

b. Apex of banner normally well reflexed from upper margin of wings; ventral median sulcus of banner usually shallow, including very little of the wings.

Keel non-ciliate.
Low or tall shrubs.
Low shrubs with long-petioled lower leaves at flowering time; var. of....
58. *L. albifrons.*
Tall shrub with all leaves short-petioled....57. *L. chamissonis.*
Stems herbaceous above ground.
Stems usually stout and fistulose, with some long-petioled lower leaves at flowering time.
Leaflets 10 to 17, 5 to 15 cm. long....41. *L. polyphyllus.*
Leaflets 5 to 9, usually not over 8 cm. long....42. *L. superbus.*
Stems not fistulose, with no long-petioled lower leaves at flowering time.
Banner narrow, acute at apex, median line much curved in bud, wings narrow and keel much exposed....43. *L. albicaulis.*
Banner ovate to suborbicular, usually obtuse or rounded at apex, wings wider and keel largely or entirely covered.
Leaves densely pubescent above, often silky; banner 11 to 14 mm. wide....46. *L. formosus.*
Leaves distinctly greenish above; banner 7 to 12 mm. wide.
Flowers 10 to 13 mm. long; petals usually bluish or purplish....
44. *L. andersoni.*
Flowers 14 to 16 mm. long; petals all light yellow.45. *L. sylvestris*

Keel ciliate on the upper margins.
Keel ciliate from the claws to about the middle, but not along the acumen.
Pedicels 5 to 10 mm. long, or largest leaflets over 5 cm. long....50. *L. latifolius.*
Pedicels 2 to 4 mm. long; leaflets not over 5 cm. long.
Stems usually much branched above; stipules inconspicuous, not villous, less than 10 mm. long.....49. *L. viridifolius.*
Stems simple or nearly so, stout and fistulous; stipules villous, 15-20 mm. long.....48. *L. barbatus.*
Keel ciliate from near apex to the middle.
Stems with few or no long-petioled lower leaves at flowering time.
Leaves densely silky both sides.
Leaflets 5 to 7, appressed-silvery; banner pubescent dorsally.....63. *L. obtusilobus.*
Leaflets 3 to 5, subappressed-silky; banner glabrous..51. *L. tidestromii.*
Leaves greenish above, or plants over 3 dm. tall.
Stems usually decumbent at base, villous at the nodes; ovules 9 to 14..52. *L. littoralis.*
Stems erect or ascending, not villous at the nodes more than elsewhere.
Shrubby at base only; seeds about 3 mm. long, without pale spots at the micropyle.....54. *L. rivularis.*
Plants becoming tall shrubs.
Leaflets usually less than 35 mm. long, glabrate or sparsely pubescent above; seeds 4 to 6 mm. long, with a pair of pale spots at the micropyle.....55. *L. arboreus.*
Largest leaflets usually 50 mm. long, silky above; seeds scarcely 4 mm. long, without pale spots at the micropyle....56. *L. longifolius.*
Stems with some long-petioled lower leaves at flowering time.
Leaflets glabrous or obscurely pubescent above, or at least not silky.
Stems elongated, rarely long-villous; leaves all cauline.53. *L. variicolor.*
Stems abbreviated, long-villous; leaves largely basal.....65. *L. saxosus.*
Leaflets usually silky-pubescent above.
Keel narrow, with long, slender acumen and narrowed toward the base, ciliate along upper edges of acumen; upper leaves usually short-petioled.....58. *L. albifrons.*
Keel broader, not narrowed toward the base, usually ciliate along most of the upper margins; upper leaves usually long-petioled.
Largest leaflets 14 to 30 mm. wide.
Stems and petioles appressed-silky.....59. *L. sericatus.*
Stems and petioles densely spreading-velvety..60. *L. cervinus.*
Largest leaflets not over 12 mm. wide.
Stems and petioles appressed-silky.....61. *L. excubitus.*
Stems and petioles spreading-pubescent.
Stems short-villous, elongated, with few scattered leaves.62. *L. grayi.*
Stems long-villous, abbreviated, with the leaves mostly crowded at the base.....64. *L. magnificus.*

Division 1.—Annuals.

1. **L. pusillus** Pursh var. **intermontànus** C. P. Sm. Loosely villous, about 1 dm. tall; leaves long-petioled, glabrous above, leaflets 5, 12 to 20 mm. long; racemes surpassed by the foliage; flowers not whorled, 7 to 9 mm. long, bracts persistent, pedicels 2 mm. long, glabrous or subvillous; calyx-cup subvillous, the lips quite villous; petals bluish to whitish, keel nearly straight, non-ciliate; pods oblong, constricted between the two seeds, which are rugose, flat, disk-like.—Dry sandy soil, Inyo and Modoc Cos.; Nev. to Ariz., w. Wyo. and e. Wash. (L. intermontanus Hel.)

2. **L. odoràtus** Hel. Glabrous or sparsely villous, subacaulescent; leaves basal, long-petioled, glabrous above, leaflets 5 to 7, 10 to 20 mm. long; flowers about 10 mm. long, scattered, bracts persistent, pedicels 4 to 6 mm. long, glabrous; calyx glabrous; petals blue or purple, banner with a yellow center, keel somewhat curved; pods oblong, 17 to 20 mm. long, smooth or scaly on the sides, villous on the margins, ovules 2 to 6, seeds rough.—Sandy plains, Mohave Desert; e. to Ariz. and Nev. Var. PILOSÉLLUS C. P. Sm. Stems and petioles conspicuously pubescent with short, spreading hairs. — Nipton; Mohave.

3. **L. rùbens** Rydb. Villous, 6 to 15 cm. tall, axial peduncles flowering before the branches fully develop; racemes exceeding the foliage; flowers 6 to 12 mm. long, approximate or well scattered, pedicels 1 to 2 mm. long, glabrous or subvillous; calyx-lips setose-villous; pods ovate, 8 to 12 mm. long, subvillous on the sides, ovules 2.—Sandy soils, Mohave Desert and Inyo Co.; e. to Utah and Ariz. Var. FLÀVOCULÀTUS C. P. Sm. Branches early developing, widely spreading, floriferous; pedicels 1 to 4 mm. long.—E.

Mohave Desert (Barnwell and Cima sta.); Inyo Co.; e. to western Nev. (L. flavoculatus Hel.)

4. **L. shóckleyi** Wats. Densely pubescent with short, spreading hairs, subacaulescent, 1 to 2 dm. tall; leaves long-petioled, subappressed-silky below, glabrous above except near the margins, leaflets 7 to 10, 10 to 20 mm. long; racemes lax, equaled by the foliage; flowers 5 to 6 mm. long, well scattered, bracts persistent, pedicels 2 to 3 mm. long, often curved, spreading-pubescent; calyx densely spreading-pubescent; petals blue, purple, or pink, keel straight on upper edges, non-ciliate; pods ovate to oblong, smooth or scaly on the sides, ciliate on the edges, ovules 2, seeds wrinkled and rough.—Desert sands, Colorado and Mohave deserts and their borders; e. to Nev. and Ariz.

5. **L. brevicáulis** Wats. Densely villous, 3 to 10 cm. tall, stems scarcely 1 cm. long; leaves basal, long-petioled, glabrous above, leaflets 5 to 8, 5 to 15 mm. long; racemes subcapitate, barely surpassing the foliage; flowers 6 to 8 mm. long, crowded, pedicels 1 to 2 mm. long, villous; calyx villous; petals bright blue or paler, keel straight, non-ciliate; pods ovate, about 10 mm. long, ovules 2 or 3, seeds 2 mm. long.—Desert sands: Bishop Creek, Inyo Co.; New York Mts.; e. Ore. to Col., N. Mex. and Chihuahua. (L. uncialis Wats. L. scaposus Rydb. L. dispersus Hel.)

6. **L. horizontàlis** Hel. Pubescent with short spreading hairs, 10 to 12 cm. tall; leaves glabrous above, petioles 4 to 6 cm. long, leaflets 7 to 9, 1 to 2 cm. long; racemes equaling or surpassing the foliage; flowers about 10 mm. long, ascending to suberect, whorled, bracts reflexed, persistent, pedicels 1 to 2 mm. long; calyx pubescent; petals pale violet-blue, banner almost plane, about 7 mm. wide, wings 4 to 5 mm. wide, keel straight, both wings and keel ciliate above and below near the claw; pods ovate, villous, 12 mm. long, ovules 2, seeds dotted.—Dry gravelly hillsides, Sunset, Kern Co. Seemingly a good species, but known from the type collection only. Var. PLATYPÉTALUS C. P. Sm. Flowers 13 to 15 mm. long, banner 11 to 12 mm. wide, its sides reflexed, wings 6 to 7 mm. wide.—Mohave Desert, n. side.

7. **L. microcárpus** Sims var. **rùber** C. P. Sm. Villous, 1 to 5 dm. tall, often much branched, the branches ascending to erect, floriferous; leaves long-petioled, glabrous above, leaflets 5 to 8, 1 to 2 cm. long; racemes of 2 to 5 verticils; flowers 8 to 10 mm. long, erect or ascending, bracts persistent, pedicels barely 1 mm. long; petals dull red to pink, banner almost plane, 4 to 6 mm. wide, keel straight, ciliate above near claw; pods ovate, 12 to 17 mm. long, more or less villous, ovules 2, seeds rugose.—Mostly dry soil, San Luis Obispo and Kern Cos. to L. Cal. (L. ruber Hel.)

8. **L. subvéxus** C. P. Sm. Intermediate between the last and the next; loosely villous, simple or branched, 2 to 4 dm. tall; flowers spreading in anthesis, becoming suberect later, 14 to 16 mm. long, in 3 to 7 distinct verticils, bracts soon reflexing, pedicels 2 mm. long; petals dark violet-purple to lilac and rose-pink, wings usually non-ciliate, keel nearly straight, ciliate above near claw; pods and ovules as in the last, seeds rough, dark brown.—Clay soils, Yolo Co. to Mt. Hamilton. (L. microcarpus of many writers and collectors.) Var. TRANSMONTÀNUS C. P. Sm. Plants 8 to 18 cm. tall, branched near the base; stems short and leaves crowded basally; verticils mostly 2 to 5, approximate; flowers 12 to 14 mm. long, banner angled at apex, 5 to 7 mm. wide.—Sandy soils, Lassen and Siskiyou Cos.; n. to southern and eastern Ore. Var. PHOENÍCEUS C. P. Sm. Like the last, but verticils 4 to 8; flowers about 10 mm. long, banner 9 to 11 mm. long; foliage greenish.—Mt. Hamilton Range. Var. ÁLBILANÁTUS C. P. Sm. Banner 12 to 14 mm. long; foliage conspicuously white woolly-villous.—Upper Salinas Valley.

9. **L. densiflòrus** Benth. Pubescence appressed or subappressed, 2 to 5 dm. tall, simple, or branched well above the base, often succulent and fistulose; leaves long-petioled, glabrous above, leaflets 7 to 9; verticils 5 to 12, approximate or well separated; flowers 14 to 18 mm. long, spreading during and after anthesis, but becoming secund when the rachis becomes bent over with weight, bracts reflexing, pedicels 1 to 2 mm. long; upper calyx-lip short, scarious, lower lip green, bent and subsaccate near base; petals lilac or rose,

keel ciliate on upper edges near claws, as also sometimes the wings; pods ovate-oblong, ovules 2, seeds variable as to size, color, and surface.—Fields, hillsides, and ravines, San Francisco Bay region, as to the typical form. Var. MENZIÈSII C. P. Sm. Stout and fistulose, pubescence sparse and appressed, petals yellow.—Sacramento and Marin Cos. to Santa Barbara. (L. menziesii Agardh.) Var. GLAREÒSUS C. P. Sm. Leaflets succulent, blackening in drying; petals light blue, banner with a white center.—Stream gravels, Mt. Pinos region. (L. glareosus Elmer.) Var. LÁCTEUS C. P. Sm. Pubescence spreading or retrorsely-spreading; lower calyx-lip nearly straight, scarcely bent or subsaccate near base; petals nearly white; usually acaulescent and unbranched.—Kern Co. and s. to desert slopes of San Diego Co. (L. lacteus Kell. L. arenicola Hel.) Var. PALÚSTRIS C. P. Sm. Long-villous, especially the bent and subsaccate lower calyx-lip; petals deep purple; plants stout, 20 to 60 cm. tall.—Contra Costa Co. to Monterey Co. (L. densiflorus Agardh. L. palustris Kell.) Var. CRINÌTUS Eastw. Low, 8 to 15 cm. tall, very villous with hairs 3 to 5 mm. long; short stems and peduncles more or less decumbent or deflexed; verticils 2 to 4.—Bodega Point, Sonoma Co. Var. AUSTROCÓLLIUM C. P. Sm. Lower calyx-lip spreading-villous, scarcely bent or subsaccate near base; petals pale-tinted, banner angled at apex.—Coastal cañons near San Diego. (For additional varieties see Bull. Torr. Club 45:167-202.)

10. **L. lutèolus** Kell. Appressed-subsilky, similar to the last, but strictly fibrous and rigid, 3 to 9 dm. tall, widely branched above; leaves cuneate-oblong; verticils few or many, crowded; petals all pale yellow, banner ovate, wings ciliate above claw and often also below, keel densely ciliate both above and below near claws; seeds uniformly dark-brown, regularly and roughly tuberculate.—Alluvial gravels and hillsides, San Benito Co. to s. Ore. (L. bridgesii Gray.)

11. **L. succuléntus** Dougl. Fig. 518. Glabrate or sparsely appressed-pubescent, 2 to 6 dm. tall, stout, usually succulent or fistulose, branched; leaves several, long-petioled, glabrous above, leaflets 7 to 9; flowers 12 to 17 mm. long, subverticillate in 4 to 8 whorls or groups, spreading in anthesis, ascending later, bracts early deciduous, pedicels 4 to 6 mm. long, spreading - pubescent; petals deep blue to almost white, banner with yellow center turning violet, wings slightly ciliate at the base above, keel ciliate near claws both above and below; pods about 5 cm. long, loosely pubescent or villous, ovules 8 to 10, seeds oblong, 4 to 5 mm. long, marbled with dark brown, a pair of whitish spots embracing the micropyle. — Ravines, moist hillsides and fields, Butte and Sonoma Cos. to L. Cal. (L. affinis of American authors, not Agardh.) Var. LÀYNEAE C. P. Sm. Depressed, 1 dm. tall, branches decumbent; racemes short; pods densely long-villous. — Farallone City, San Mateo Co.

518. Lupinus succulentus Dougl.: *a*, fl. branchlet x. ¼; *b*, upper calyx-lip x 1; *c*, lower calyx-lip x 1; *d*, banner x 1; *e*, wing x 1; *f*, keel x 1.

12. **L. nànus** Dougl. Minutely spreading- or appressed-pubescent and more or less villous, simple or branched at the base, erect, 2 to 6 dm. tall; leaves long-petioled, usually appressed-hairy above, leaflets 5 to 7, linear to spatulate, 15 to 30 mm. long; verticils well separated; flowers 10 to 16 mm. long, bracts deciduous, pedicels 5 to 8 mm. long; petals rich blue, rarely pink, all broad, banner with white or yellow center changing to violet, keel ciliate on upper edges of acumen; pods appressed-pubescent, 20 to 35 mm. long, ovules usually 4 to 8, rarely 8 to 12, seeds 2 to 3 mm. long, variously colored and marked.—Grassy hills, common in the Coast Ranges from Mendocino Co. to Santa Barbara, less common in the Sierra Nevada foothills from Calaveras Co. to Tulare Co. (L. affinis Agardh.) Var. PERLÀSIUS C. P. Sm. Densely villous with hairs 2 to 3 mm. long; flowers about 4 mm. long.—Mariposa-Coulterville road. Var. CARNÒSULUS C. P. Sm. Largest leaflets 25 to 40 mm. long; pods 30 to 50 mm. long by 7 to 9 mm. wide, seeds about 5 mm. long. —San Francisco Bay region; w. Ore. (L. carnosulus Greene. L. affinis var. carnosulus Jepson.) Var. MÉNKERAE C. P. Sm. Leaflets 10 to 15 mm. long, 2 to 3 mm. wide; flowers 10 to 12 mm. long; petals pale lilac, drying blue; pods 20 to 25 mm. long, barely 4 mm. wide, ovules 9 to 12, seeds pale flesh-color, obscurely marked.—Kern Co. to Coalinga, Fresno Co. Var. VALLÍCOLA C. P. Sm. Flowers 6 to 10 mm. long; banner usually wider than long, its apex not much reflexed from upper margins of wings, keel strongly curved; seeds pale.—Sierra Nevada foothills from Butte Co. to Kern Co.; probably casual at Wright, Santa Clara Co. (L. persistens and vallicola Hel.) Var. APRÌCUS C. P. Sm. Like the last, but banner not wider than long, its apex well reflexed from upper edges of wings; seeds dark, well marked.—Monterey Co. to sw. Ore. (L. apricus Greene. L. vallicola var. apricus C. P. Sm.)

13. **L. pachýlobus** Greene. Conspicuously villous, 1 to 3 dm. tall, stout, usually branched at the base; petioles 6 to 8 mm. long, leaflets 6 to 8, 15 to 25 mm. long, hairy both sides; racemes of 2 to 4 whorls; flowers few, 6 to 8 mm. long, sometimes scattered, pedicels 1 to 2 mm. long; petals blue, banner suborbicular, 6 to 8 mm. wide, with a white center, keel non-ciliate or nearly so; pods especially large, 25 to 30 mm. long, 6 to 9 mm. wide, thick and succulent when green, ovules 4 to 6, seeds 4 to 5 mm. long, brown, marked with darker shades. — Grassy hills, Shasta Co. to Mariposa and Santa Clara Cos. (L. micranthus var. pachylobus Jepson.)

519. Lupinus bicolor var. microphyllus C. P. Sm.; *a*, habit x ⅓; *b*, banner x 2; *c*, wing x 2; *d*, keel x 2.

14. **L. bìcolor** Lindl. Usually villous, 1 to 4 dm. tall, erect and simple, or diffusely branched at the base; leaves pubescent both sides, petioles 3 to 7 cm. long, leaflets 5 to 7, 10 to 20 mm. long; verticils 1 to 3; flowers 8 to 12 mm. long, rarely scattered or umbellate by reduction of the raceme, pedicels 1 to 3 mm. long; petals blue and white, banner about 8 mm. long by 6 to 8 mm. wide, elliptic, rhombic, obovate to orbicular-obovate, the white center changing to violet, the sides much reflexed, keel slender, ciliate along upper edges of slender acumen; pods appressed-hairy, 15 to 20 mm. long by 3 to 5 mm. wide, ovules 5 to 8, seeds 2 to 3 mm. long, variously colored and marked.—Mostly sandy soils, common coastwise from San Luis Obispo Co. to Vancouver Isl.; less common in the Sierra foothills. (L. micranthus var. bicolor Wats. L. sabulosus Hel. L.

strigulosus Gand.) Var. UMBELLÀTUS C. P. Sm. Racemes reduced to one verticil; flowers 6 to 8 mm. long.—Santa Cruz Isl. (L. umbellatus Greene.) Var. TRIDENTÀTUS Eastw. Verticils 3 to 6 or more; flowers 6 to 8 mm. long; lower calyx-lip tridentate.—Sandy loams or clays, San Diego Co. to Vancouver Isl., abundant in the San Francisco Bay region. Var. PIPERSMÍTHII C. P. Sm. Flowers 5 to 8 mm. long, keel non-ciliate or with 1 to 4 stray cilia. —San Joaquin Valley to Napa, San Mateo and Monterey Cos. (L. pipersmithii Hel.) Var. MICROPHÝLLUS C. P. Sm. Fig. 519. Flowers 4 to 6 mm. long, keel ciliate; ovules 5 to 8.—San Diego Co. to Ore.; abundant in S. Cal., where known as L. micranthus. (L. micranthus var. microphyllus Wats. L. rostratus Eastw.) Var. TETRASPÉRMUS C. P. Sm. Similar to the last, but ovules mostly 4, the pods much like those of Vicia tetrasperma.—Wright, Santa Clara Co. Var. TRÍFIDUS C. P. Sm. Flowers 5 to 8 mm. long; lower calyx-lip deeply trifid.—Coastal sands, San Francisco and Monterey. (L. micranthus var. trifidus Wats. L. trifidus Torr.)

15. **L. micránthus** Dougl. Appressed- or subappressed-pubescent and more or less villous, 1 to 4 dm. tall, simple or branched at the base, stout and succulent or slender and fibrous; leaves glabrous or sparsely hairy above, leaflets 5 to 7, linear to oblanceolate; verticils 2 to 7; flowers 5 to 8 mm. long, pedicels stout, 1 to 2 mm. long; calyx-lips broad; petals blue and white, banner cuneate or spatulate, center turning violet, the sides scarcely reflexing, keel short and broad, the blunt acumen scarcely upturned, ciliate above; pods 25 to 30 mm. long, appressed-hairy, ovules 6 or 7, seeds oblong, thick, 3 mm. long, gray- or brown-mottled.—Largely clay soils, San Diego Co. to Vancouver Isl., inland to Modoc and Plumas Cos.; abundant in the San Francisco Bay region. Much confused with the small-flowered forms of L. bicolor. (L. polycarpus Greene.)

16. **L. concínnus** Agardh. Densely villous, 6 to 20 cm. tall, simple or much-branched from the base; leaves long-petioled, hairy above, leaflets 5 to 8, 10 to 20 mm. long; racemes nearly sessile, 3 to 6 cm. long, surpassed by the leaves, a short raceme or one or two flowers sometimes representing all the growth from certain axillary buds; flowers 6 to 12 mm. long, usually well scattered, pedicels 1 mm. long, stout, long-villous; petals lilac, edged with rich reddish-purple, banner obovate, rounded or emarginate at apex, keel nearly straight; pods 10 to 15 mm. long, ovules 2 to 4, seeds 2 to 3 mm. long, angled, nearly square, pale, obscurely spotted.—Sandy soil, Monterey Co. to L. Cal., e. to N. Mex. Var. ORCÚTTII C. P. Sm. Flowers 6 to 7 mm. long, banner narrower, about 3 mm. wide.—Monterey Co. to L. Cal. and Sonora, e. to southern Utah and N. Mex. (L. orcuttii Wats. L. micensis Jones.) Var. OPTÀTUS C. P. Sm. Larger throughout, 20 to 30 cm. tall; flowers 10 to 12 mm. long, banner 7 to 9 mm. wide.—Monterey Co. to San Bernardino and San Diego Cos.; apparently confined to Cal. and inhabiting soils with a greater water supply. Var. AGÁRDHIÀNUS C. P. Sm. Pubescence spreading but short and less dense; petals edged with rose-purple or bright blue, banner angled at apex.—Monterey Co. to San Diego, e. to Fort Tejon and Cajon Pass. (L. gracilis Agardh. L. agardhianus Hel.) Var. PÁLLIDUS C. P. Sm. Appressed-pubescent mainly; leaflets 5 or 6, spatulate; petals white or pale bluish.—S. San Diego Co.; adjacent L. Cal. (L. pallidus Bdg.) Var. DESERTÒRUM C. P. Sm. Pubescence mainly appressed; leaflets 6 to 9, oblanceolate; petals white or yellowish.—Mohave Desert (Randsburg and Ord Mts.). (L. desertorum Hel.)

17. **L. hirsutíssimus** Benth. Hirsute with nettle-like stiff hairs 3 to 5 mm. long, stout, fistulose, 2 to 6 dm. tall; leaves long-petioled, leaflets 5 to 8, broadly cuneate-obovate; flowers 13 to 15 mm. long, scattered, spreading, pedicels 3 to 4 mm. long; petals violet or lilac, banner suborbicular, keel stout, straight, ciliate at the free edges below only; pods 25 to 35 mm. long, very hirsute, ovules about 7, seeds 3 to 4 mm. long, pale and obscurely marked or densely marbled with dark brown.—Lightly-shaded areas in the hills, San Mateo Co. to L. Cal.

18. **L. truncàtus** Nutt. Sparsely appressed-pubescent or glabrate, 3 to 6 dm. tall, branched; leaves many, glabrate, petioles usually flattened, leaflets

5 to 7, linear, truncate, emarginate, or dentate at the apex; racemes lax and few-flowered; flowers 10 to 12 mm. long, spreading or drooping after anthesis, pedicels 2 to 3 mm. long, bracts usually persistent; petals violet or paler purple, keel densely ciliate above from the stout, blunt acumen to the claw, and below near the claw; pods spreading, about 3 cm. long, villous, ovules 6 or 7, seeds obscurely or conspicuously marked.—Open woods or thickets, Monterey to L. Cal.

19. **L. bènthami** Hel. Villous, slender, erect, 3 to 6 dm. tall, simple or branched at the base; leaves long-petioled, leaflets 7 to 10, linear; flowers 10 to 12 mm. long, spreading, bracts linear, exceeding the buds, long-villous, deciduous, pedicels 4 to 10 mm. long; petals blue, banner suborbicular, the yellow center early changing to reddish-purple, keel slender, curved, ciliate on lower edges near claws; pods 2 to 3 cm. long, ovules 3 or 4, seeds marked with brown.—Rather moist slopes, near streams, Sierra foothills from Sacramento Co. to Kern Co.; Santa Barbara Co. to Monterey Co. (L. leptophyllus Benth., not S. & C.) Var. ÓPIMUS C. P. Sm. Larger in all parts except the calyx; stems stouter and fistulose; leaflets longer, 2 to 3 mm. wide; racemes 20 to 30 cm. long; flowers 14 to 16 mm. long, pedicels 7 to 9 mm. long; banner as wide or wider than long, keel more arcuate.—Eldorado Co. to Los Angeles and San Luis Obispo Cos.

20. **L. sparsiflòrus Benth.** Appressed-pubescent and more or less villous or subhirsute, 2 to 4 dm. tall, slender, branched; leaves several, long-petioled, hairy or glabrate above, leaflets 5 to 9, linear to oblanceolate, angled at apex; flowers 8 to 13 mm. long, spreading in anthesis, soon becoming suberect, bracts villous, exceeding buds, often subpersistent, pedicels 2 to 3 mm. long; petals bright blue or purplish, banner with a yellow spot, keel curved, usually ciliate on the lower edges near claw and often also on the upper margins; pods ascending, 12 to 18 mm. long, ovules 5 or 6, seeds dotted or marbled on a pale ground.—Grassy hillsides, clays or sands, Ventura Co. to L. Cal., e. to Ariz. and southern Nev. (L. subhirsutus Dav.) Var. ARIZÒNICUS C. P. Sm. Plants mostly 1 to 2 dm. tall; flowers 8 to 10 mm. long.—Desert sands, Mohave and Colorado deserts to Sonora, Ariz., and s. Nev. (L. concinnus var. arizonicus and L. arizonicus Wats.) Var. BARBÁTULUS Thornber. Stems stout and fistulose; petals pale lilac or purplish.—Needles; w. Ariz.; L. Cal. Var. INOPINÀTUS C. P. Sm. Branched above the middle; leaflets broad at the apex, truncate, rounded, or emarginate; racemes lax, 6 to 15 cm. long.—Cajon Pass to L. Cal. Var. PÓNDII C. P. Sm. Lower, branched at the base; leaflets as in the last; racemes compact, 2 to 8 cm. long.—San Diego Co. to L. Cal. (L. pondii Greene.)

21. **L. citrìnus** Kell. Short hairy, 10 to 20 cm. tall, branched at the base; leaflets 6 to 8; flowers spreading in anthesis but soon deflexing, pedicels 3 mm. long, spreading-pubescent; petals bright orange or golden, keel nearly straight, ciliate on lower edges near claws; pods deflexed, glabrate, 12 to 15 mm. long, ovules 2 to 4, seeds black-spotted on a pale ground.—Sierra Nevada foothills of Fresno Co.

22. **L. defléxus** Congdon. Much like no. 21 but 20 to 40 cm. tall; pedicels 3 to 4 mm. long; petals dull white or pinkish; pods about 20 mm. long, ovules 5 to 8, seeds unspotted.—Sandy soil, Mariposa Creek, near Mariposa.

23. **L. stìversi** Kell. Minutely pubescent, 15 to 45 cm. tall, branches ascending; leaves long-petioled, appressed-pubescent both sides, leaflets 6 or 7; racemes 1 to 3 cm. long, few-flowered; flowers about 15 mm. long, pedicels about 2 mm. long, appressed-pubescent; banner bright yellow, wings rose-pink or purple, keel nearly straight, the acumen blunt, ciliate both above and below near claws; pods about 20 mm. long, ovules 5 to 7, seeds flat, angled, dark-spotted.—Sands or gravels in the foothills: Butte Co. to San Bernardino Mts.; Santa Lucia Mts.

DIVISION 2.—Perennials.

24. **L. lyállii** Gray. Subappressed-silky, low, woody at base, rarely over 1 dm. tall; leaves long-petioled, crowded near the base, leaflets 5 or 6, 4 to 10 mm. long, appressed-silky both sides; peduncles usually curved or bent,

spreading or decumbent, racemes capitate or subcapitate, rarely more than twice as long as wide; flowers 10 to 12 mm. long, bracts short, deciduous, pedicels 2 mm. long, spreading-pubescent; petals blue, banner glabrous, 8 to 12 mm. long, wings narrow, keel nearly straight, usually ciliate on the upper edges, rarely non-ciliate; pods silky, 10 to 15 mm. long, ovules 3 or 4.—Dry mountain tops, Sierra Nevada from Fresno and Inyo Cos. northw.; n. to Wash. Var. DANAUS Wats. Flowers only 6 to 8 mm. long, commonly white or pale lilac; leaflets silky, usually not over 6 mm. long.—High peaks, Sierra Nevada from Mono and Tuolumne Cos. to Eldorado Co.; w. Nev. (L. danaus Gray.) Var. LÒBBII C. P. Sm. Flowers 6 to 8 mm. long; petals violet-blue or paler; leaflets distinctly greenish, usually 10 to 20 mm. long.—High peaks, Sierra Nevada from Eldorado Co. northw.; Mt. Rose, Nev.; Ore. (L. lobbii Gray. L. aridus var. lobbii Wats. L. alpinus Hel.)

25. **L. tórreyi** Gray. Fig. 520. Appressed-silky, not woody at base, 12 to 20 cm. tall; leaves long-petioled, crowded near base, leaflets 6 to 8, appressed-silky both sides, 12 to 25 mm. long; peduncles ascending or erect, usually exceeding the foliage, racemes cylindric, dense, 5 to 10 cm. long; flowers 8 to 9 mm. long, bracts persistent, pedicels hardly 2 mm. long, appressed-pubescent; petals violet-blue, banner oval or ovate, glabrous, center changing from yellow to purple, keel scarcely curved, ciliate on upper margins; pods silky, about 12 mm. long, ovules 3 or 4, seeds whitish or pinkish. — Mostly dry soil, Sierra Nevada from Tulare Co. northw.; far n. to eastern Wash. (L. sellulus Kell.)

520. Lupinus torreyi Gray; *a*, habit x ⅓; *b*, banner x 1; *c*, wing x 1; *d*, keel x 1; *e*, pod x 1.

26. **L. confértus** Kell. Very much like no. 25, but flowers larger, 10 to 13 mm. long; stems usually elongated and leafy, 2 to 4 dm. tall; petioles 10 to 15 cm. long, leaflets silky both sides; racemes conoidal-cylindric, 8 to 16 cm. long; flowers many, crowded, all spreading.—San Bernardino Mts.; Mt. Pinos; n. in the Sierra Nevada to Plumas Co.; w. Nev.

27. **L. hypolàsius** Greene. Loosely appressed-hairy and more or less villous, stems longer than the peduncles, stoutish, leafy, suberect, 5 to 15 cm. tall; lower leaves long-petioled, leaflets 5 to 7, 6 to 8 mm. long, appressed-hairy above, villous beneath; flowers in 3 or 4 whorls, spreading, 7 to 8 mm. long, bracts early deciduous or subpersistent, pedicels 1 to 2 mm. long, spreading-pubescent; petals purple or blue, banner suborbicular, keel nearly straight, ciliate on upper edges; pods 15 mm. long, villous, ovules 3 or 4, seeds obscurely mottled.—High mountain sides, Tulare Co. (Farewell Gap, Mineral Gap) and Fresno Co.

28. **L. praténsis** Hel. Appressed-pubescent, except in the inflorescence, stems fistulose, 6 to 9 dm. tall; leaves mostly short-petioled, finely appressed-pubescent both sides, leaflets 5 to 9, 3 to 8 cm. long, 3 to 8 mm. wide; racemes dense; flowers crowded, 10 to 12 mm. long, bracts persistent, lanceolate, pedicels 2 to 3 mm. long, densely spreading-pubescent; petals blue, violet, lilac or tawny, banner ovate or oval, glabrous, keel straight, ciliate on upper edges; ovules 5, pods 18 to 20 mm. long, loosely pubescent.—Moist sandy soil, foothills, w. Inyo and Mono Cos. Var. ÉRIOSTÁCHYUS C. P. Sm. Floral bracts inconspicuous in the creamy woolly immature racemes; banner pubescent on

the back, dark purple, wings pale blue.—Big Pine Creek, Inyo Co., 9000 ft. (Peirson 530).

29. **L. covíllei** Greene. Similar to no. 28, but loosely shaggy with long, spreading hairs; peduncles 1 to 3 cm. long, not surpassing the uppermost foliage; flowers 12 to 14 mm. long, bracts and conspicuous calyx bractlets linear or filiform; banner suborbicular, keel sparsely ciliate on upper margins at base of acumen; ovules 5 to 6, pods about 25 mm. long, shaggy.—High mountain slopes, 9000 to 10,000 ft., Sierra Nevada from Farewell Gap to the Yosemite region. (L. dasyphyllus Greene.)

30. **L. leucophýllus** Dougl. Tomentose-canescent and more or less villous, often densely so, stout, erect, branched, 6 to 9 dm. tall; leaves woolly, lower long-petioled, leaflets 7 to 9, 3 to 6 cm. long, densely pubescent above; racemes 8 to 30 cm. long, usually dense and cylindrical, flowers crowded, 12 to 14 mm. long, bracts usually persistent, shorter or longer than the buds, pedicels densely spreading-pubescent, 1 to 2 mm. long; petals white, pinkish, bluish, or purple, often turning brown in drying, banner small, ovate or oblong, pubescent on the back, keel stout, ciliate on the upper margins; pods woolly, 20 to 25 mm. long, ovules 3 to 6, seeds reddish-brown and obscurely mottled, or drab and gray-spotted.—Dry soils, Colusa, Trinity and Lassen Cos.; n. to eastern Wash.

31. **L. canéscens** Howell. Scarcely differing from no. 30 except in the absence of the longer hairs overlying the short appressed or tomentose canescence; probably not a good species.—Dry soils, Modoc Co.; n. to eastern Wash.

32. **L. brèweri** Gray. Appressed-silvery-silky, shrubby, low, prostrate or decumbent, branched and matted, season's growth 2 to 15 cm. long; leaves crowded basally or scattered along the stem, leaflets 7 to 10, 5 to 20 mm. long; racemes densely flowered, 3 to 5 cm. long; flowers 7 to 10 mm. long, sometimes scattered, bracts deciduous, pedicels 1 to 3 mm. long; petals violet, banner obovate to suborbicular, center yellowish or white, back glabrous or pubescent near middle, keel straight on upper edges where non-ciliate or with a few cilia; pods about 12 mm. long, ovules 3 or 4, seeds flesh-color, marked with olive-brown.—Rocky mountain tops: San Bernardino Mts.; Mt. Pinos; Sierra Nevada; n. to southern Ore. (Ashland Butte). Var. PÁRVULUS C. P. Sm. Stems as in the species; flowers 5 to 7 mm. long; racemes usually subcapitate, little exceeding the foliage.—Sierra Co. (Gold Lake, Hall & Babcock 4507, type) to Ventura Co. Var. BRYOÍDES C. P. Sm. Stems of season barely 1 cm. long; petioles about 1 cm. long; leaflets about 5 mm. long; flowers 4 to 6 mm. long; whole plant suggesting a congested mass of coarse moss.—Tulare Co. (Olancha Mt., Hall & Babcock 5247, type); Ventura Co. Var. GRANDIFLÒRUS C. P. Sm. Stems very short, about 1 cm., leaves crowded at the base, petioles 4 to 6 cm. long; flowers scattered, 11 to 12 mm. long, the banner more reflexed than usual for this species, raceme exceeding the foliage.—Mono Craters, Mono Co. (R. S. Ferris 1463).

33. **L. meionánthus** Gray. Densely subappressed-silky, woody at base only, erect or ascending, 3 to 6 dm. tall; leaves all short-petioled, leaflets 6 to 9, silky both sides, 12 to 20 mm. long; racemes densely flowered; flowers about 6 mm. long, pedicels 3 mm., subappressed-pubescent; petals blue or lilac, banner glabrous, suborbicular, yellow in the center, keel ciliate on upper edges, the acumen short, broad, and obtuse, fruit not seen.—Mountain forests, Madera Co. to Plumas Co.; Mt. Rose, Nev.

34. **L. laxiflòrus** Dougl. var. **calcaràtus** C. P. Sm. Appressed-pubescent, hardly silky, erect or ascending, 3 to 8 dm. tall; leaves cauline, lower long-petioled, subsericeus or glabrate above, leaflets 7 to 9, 3 to 4 cm. long; racemes 8 to 18 cm. long, compact or loose; flowers 11 to 14 mm. long, bracts early deciduous, pedicels 4 to 8 mm. long; calyx-cup distinctly spurred above, the spur 1 to 3 mm. long, often only the lower lip green, upper lip broad, notched, largely or entirely exposed, lower narrow; petals blue, rose, or pale yellow, banner long-clawed, more or less pubescent near middle of back, wings pubescent on sides near upper distal angle, keel ciliate on upper

edges of acumen; pods 25 mm. long, ovules 4 to 6, seeds reddish-brown or paler, obscurely mottled.—Open hillsides, east of the Sierra Nevada divide in Eldorado, Placer and Modoc Cos.; n. to southern Ida., e. to western Utah. (L. calcaratus Kell. L. multitinctus A. Nels. L. variegatus Hel.) Var. SILVÍCOLA C. P. Sm. Calyx spur scarcely 1 mm. long; flowers only 8 to 9 mm. long; petals mostly blue, violet tinged.—Open forests, Mariposa Co. to Siskiyou Co.; n. to southern Ore. (L. silvicola Hel.) Var. COGNÀTUS C. P. Sm. Like the last, but flowers 10 to 13 mm. long and upper calyx-lip largely concealed by the reflexed sides of the broad short-clawed banner.—San Gabriel Mts.; Modoc Co.; n. to eastern Ore. (Wallowa Mts., Ore., Cusick 3187, type).

35. **L. graciléntus** Greene. Glabrate, some 6 dm. tall, slender throughout; petioles 5 to 12 cm. long, leaflets about 7, linear-falcate, 4 to 6 cm. long; racemes 6 to 12 cm.; flowers 8 to 10 mm. long, in 4 to 6 distinct whorls, pedicels 2 to 3 mm. long, appressed-pubescent; calyx-cup not spurred; petals blue, banner and wings glabrous, keel falcate, acumen with a few cilia on upper margins; ovules 7 to 8, pods and seeds not seen.—Tuolumne Cañon. Seemingly a fair species, though known only from the type collection.

36. **L. onústus** Wats. Sparsely appressed-silky, slender, decumbent, 15 to 21 cm. tall; leaves long-petioled, appressed-silky below, glabrous above, leaflets 5 to 8, 25 to 40 mm. long; racemes few-flowered; flowers 8 to 11 mm. long, scattered, bracts short, deciduous, pedicels appressed-pubescent, about 3 mm. long; calyx-cup not spurred; petals deep blue, banner and wings glabrous, keel nearly straight, ciliate on upper edges; pods 35 to 40 mm. long by 12 wide, subsilky, ovules 5 or 6, seeds brown.—Open pine woods, Plumas, Lassen and Siskiyou Cos. (L. pinetorum Jones. L. violaceus Hel.)

37. **L. ludovicianus** Greene. Densely woolly-pubescent and villous throughout, except the petals, almost woody at base, erect, 3 to 6 dm. tall; leaves velvety-woolly both sides, petioles 6 to 10 cm. long, leaflets 4 to 8, cuneate or spatulate; flowers 10 to 12 mm. long, whorled, pedicels 3 mm. long; calyx not gibbous; petals purplish, darkest in center of banner, apex of which is not much reflexed from wings, keel nearly straight on upper margins where distinctly ciliate; pods densely appressed-pubescent, 20 to 25 mm. long by 5 to 7 wide, ovules 5 to 7, seeds grayish-yellow, obscurely marked, or heavily mottled.—Dry soil, San Luis Obispo Co.

38. **L. caudàtus** Kell. Densely appressed-silky or -satiny, subdecumbent to erect, 2 to 5 dm. tall; lower leaves long-petioled, densely silvery both sides, leaflets 5 to 7, 2 to 3 cm. long; flowers 10 to 14 mm. long, scattered or subverticillate, pedicels 3 to 4 mm. long, appressed-pubescent; calyx with a spur about 1 mm. long; petals violet-blue, banner silky on the back, wings glabrous, keel ciliate on the upper edges; pods about 3 cm. long, silky, ovules 5 or 6, seeds reddish-brown to flesh-pink.—Open dry soils, foothills, e. side Sierra Nevada from Mono Co. to Modoc Co.; w. Nev., e. Ore. and adjacent Ida. (L. argentinus Rydb.)

39. **L. inyoénsis** Hel. Much like the last, but pubescence of stems and pedicels spreading and few or no long-petioled lower leaves at flowering time; flowers 12 to 14 mm. long, banner usually glabrous on the back, as wide as long, wings glabrous, keel ciliate.—Foothills, w. Inyo Co. Var. ERIÓCALYX C. P. Sm. Plants 10 to 30 cm. tall; racemes 4 to 8 cm. long, compact; pedicels 1 to 2 mm. long, flowers 10 to 11 mm. long; calyx woolly-villous; banner woolly-pubescent on the back.—Dry soil, high Sierra Nevada from Madera Co. to Inyo Co. (e. of the Minarets, J. W. Congdon, type).

40. **L. corymbòsus** Hel. Sparsely appressed-pubescent, erect, branched above, 3 to 6 dm. tall; leaves short-petioled, glabrate above, more or less silvery-silky below, leaflets 5 to 7; flowers 10 to 13 mm. long, scattered or subverticillate, pedicels 3 to 6 mm. long, appressed-pubescent; petals cream-colored, lilac, or blue, banner glabrous or slightly pubescent on the back, 9 to 12 mm. wide, wings glabrous, keel ciliate or non-ciliate, the acumen much-upturned; pods appressed-silky, 20 to 25 by 5 mm., ovules 2 to 4, seeds pale or dark flesh-colored, mostly unmarked.—Dry soils, Siskiyou Co.; Nev. to e. Ore. and s. Ida.

41. **L. polyphýllus** Lindl. Minutely appressed- or spreading-pubescent, erect, stout and fistulose, 3 to 10 dm. tall; leaves mostly long-petioled, glabrous or minutely hairy above, leaflets 10 to 17, 7 to 15 cm. long, 15 to 30 mm. wide; racemes 15 to 60 cm. long; flowers 12 to 14 mm. long, usually not crowded, more or less whorled, bracts early deciduous, pedicels 5 to 9 mm. long, usually appressed-pubescent; petals blue, purple, reddish, or yellowish, glabrous, keel falcate, non-ciliate; pods dark brown, loosely hairy, 25 to 40 mm. long, ovules 5 to 9, seeds 4 mm. long, variously marked.—Moist soil, Lake Co.; n. to B. C. Var. GRANDIFÒLIUS C. P. Sm. Stems more or less villous; racemes compact; pedicels stouter, 6 to 9 mm. long, densely spreading-pubescent.—Near the coast from Mt. Hermon and New Years Point to Sonoma Co. (L. grandifolius Lindl. L. magnus Greene.)

42. **L. supérbus** Hel. Similar to no. 41, but leaflets 5 to 9, usually not over 8 cm. long; racemes 15 to 20 cm. long, densely-flowered; flowers 10 to 12 mm. long; ovules 7 or 8. — Meadows near Bishop, Inyo Co. Var. ELONGÀTUS C. P. Sm. Fig. 521. Flowers larger, 12 to 15 mm. long, and scattered or in lax verticils.—Wet soil near streams in the Sierra Nevada from Tulare Co. to Modoc Co.; w. Nev. (L. burkei Wats. in part. L. elongatus Greene.) Var. BERNARDÌNUS Abrams. Flowers smaller, only 8 to 11 mm. long, usually scattered in loose racemes. — Wet soil near streams, San Bernardino Mts. (Deep Creek, Abrams & McGregor 733, type) to Butte Co.

521. Lupinus superbus var. elongatus C. P. Sm.; *a*, fl. stem x ⅓; *b*, banner x 1; *c*, wing x 1; *d*, keel x 1; *e*, pod x ½.

43. **L. albicáulis** Dougl. Thinly appressed-pubescent, rather stout, branched above, 5 to 9 dm. tall; leaves cauline, short-petioled, leaflets 5 to 9, thinly appressed-hairy both sides; flowers 12 to 16 mm. long, not crowded, pedicels spreading-pubescent, 4 to 6 mm. long; petals purple to dirty-white, fading brown, all narrow, banner lance-ovate, acute at apex, keel much curved, non-ciliate, much exposed; pods 3 to 4 cm. long, 8 to 10 mm. wide, ovules about 6, seeds compressed, about 4 mm. long, gray-mottled. — Open dry or moist soil, Nevada Co. to Shasta and Siskiyou Cos.; n. to western Wash. (L. falcifer Nutt.) Var. SHASTÉNSIS C. P. Sm. More slender, the flowers only 8 to 10 mm. long.—Siskiyou Co.; s. Ore. (L. shastensis Hel.)

44. **L. andersòni** Wats. Much like no. 43, but banner and wings much broader, the keel little or not at all exposed; banner obtuse or rounded at apex, keel arcuate, non-ciliate, petals blue, purplish, or yellowish; flowers 10 to 13 mm. long.—San Bernardino Mts.; Sierra Nevada from Tulare Co. to Siskiyou Co.; w. Nev.; s. Ore. Var. APÉRTUS C. P. Sm. Stems 2 to 4 dm. tall, usually unbranched or with sterile branchlets, foliage greener; banner more or less pubescent near apex, dorsally.—Placer and Nevada Cos. near Donner Lake. (L. apertus Hel.) Var. FULCRÀTUS C. P. Sm. Branched or unbranched, 3 to 8 dm. tall; stipules green and leaflike, lanceolate, oblanceolate, elliptic, or oval, the stipules being linear or subulate in the species.—Sierra Nevada forests from Fresno Co. to Eldorado Co. (L. fulcratus and L. fraxinetorum Greene.)

45. **L. sylvéstris** Drew. Much like L. andersoni, but flowers larger, 14 to 16 mm. long, petals all pale yellow, keel usually stouter, and less curved, the acumen shorter in proportion; ovules 4 or 5, seeds about 7 mm. long, flesh-pink, minutely speckled with olive-drab.—South Fork Mt.; Salmon Mts.; Mt. Eddy. (L. albicaulis var. silvestris Greene. L. elmeri Greene.)

46. **L. formòsus** Greene. Silky-pubescent, decumbent to erect, 3 to 8 dm. tall; leaflets 7 to 9, densely pubescent above; flowers usually whorled, 12 to 16 mm. long, pedicels spreading-pubescent, 3 to 4 mm. long; petals rich purple, blue, lilac, or white, banner 11 to 14 mm. wide, keel usually slender and much curved, non-ciliate; pods silky, 30 to 35 mm. long, ovules 5 to 7, seeds mottled with gray or brown.—Open fields and woods, valleys or hills, Plumas, Shasta and Mendocino Cos. to San Diego Co. (L. proximus Hel.) Var. BRÍDGESI Greene. Differing only in having many spreading hairs; stems 2 to 4 mm. thick; petioles 30 to 60 mm. long; flowers 14 to 16 mm. long; banner strictly glabrous.—Same range as the species. (L. albicaulis var. bridgesi Wats. L. bridgesi and greenei Hel.) Var. ROBÚSTUS C. P. Sm. Stems stouter, 6 to 7 mm. thick; flowers 16 to 18 mm. long; lower calyx-lip 12 to 14 mm. long; banner oblong, 15 to 18 mm. long.—Valley fields, Colusa Co. (College City, Heller & Brown 5573, type) to Fresno Co. Var. CLEMÉNSAE C. P. Sm. More or less villous, simple or with sterile foliaceous branches, 2 to 4 dm. tall; leaflets loosely pubescent above, petioles only 15 to 20 mm. long; flowers 10 to 14 mm. long, banner often pubescent on the back.—Hillsides, Plumas Co. (Greenville, Mary S. Clemens, type). Var. HYACÍNTHINUS C. P. Sm. Pubescence thinner and leaves decidedly greenish, hardly silky, 6 to 12 dm. tall; lower calyx-lip about 10 mm. long; banner 14 to 18 mm. wide, blue or purplish with yellow center.—San Gabriel and San Jacinto Mts. (L. hyacinthinus Greene.) Var. ELÀTUS C. P. Sm. Erect, branched above, 5 to 9 dm. tall; leaflets silvery-silky above, duller below; flowers 10 to 14 mm. long, banner sometimes pubescent near middle of back.—Under pines, San Antonio Mts. and San Bernardino Mts. (L. elatus Jtn.)

47. **L. adsúrgens** Drew. Much like typical L. formosus, but flowers smaller, 9 to 12 mm. long, the petals pale yellow, lilac, or blue, the banner 6 to 8 mm. wide, not much reflexed from upper margin of wings; root large and woody.—Higher mountain slopes, inner Coast Ranges from Mt. Hamilton n. to Cascades of Ore. (L. pendeltoni Hel. L. gormani Piper.) Var. LILACÌNUS Hel. Pubescence more spreading, hardly silky; pedicels stouter, 4 to 6 mm. long; flowers 12 to 14 mm. long; banner 10 to 11 mm. wide, wings much exceeding keel, petals pale lilac.—Glenn Co. (Heller 11,945, type). Var. UNDULÀTUS C. P. Sm. Differing from var. lilacinus in wings not exceeding keel and banner with undulate margin.—Yosemite to Tuolumne Grove (Eastwood 13, type).

48. **L. barbàtus** (Henderson) Hel. Glabrate or sparsely villous, stout, fistulous, usually unbranched, 6 to 9 dm. tall; leaves short-petioled, glabrous above, sparsely subvillous below, stipules long and conspicuously villous, leaflets 6 to 9, oblanceolate, mostly obtuse; racemes 12 to 18 cm. long; flowers 8 to 10 mm. long, scattered or subverticillate, pedicels 2 to 4 mm. long, glabrate, bracts villous, exceeding buds, deciduous; petals lilac or yellowish, keel arcuate, ciliate on upper edges from middle to near claws.—Modoc Co.; s. Ore. (L. ligulatus barbatus Henderson.)

49. **L. viridifòlius** Hel. Glabrate to sparsely appressed-pubescent, slender or stoutish and more or less fistulous below, much branched above, 6 to 10 dm. tall; leaves short-petioled, glabrous above, sparsely appressed-hairy beneath, stipules short and inconspicuous, leaflets 6 to 8, bright green oblanceolate, acutish; racemes 6 to 10 cm. long; flowers 8 to 11 mm. long, scattered or subverticillate, pedicels 2 to 4 mm. long, appressed-pubescent, bracts short, villous, early deciduous; petals pale violet-blue, keel more or less curved, ciliate as in the last; pods blackish, silky, about 20 mm. long, ovules about 7.—Wooded slopes, Shasta Co.; s. Ore.

50. **L. latifòlius** Agardh. Glabrate or minutely appressed-pubescent, rarely with some spreading hairs, usually branched above, 6 to 12 dm. tall; long-

petioled lower leaves usually withered by flowering time, the middle leaves largest, petioles and leaflets 4 to 10 cm. long, the latter mostly acute, 5 to 8 in number; racemes 15 to 45 cm. long, rather lax; flowers 10 to 14 mm. long, verticillate or scattered, bracts early deciduous, pedicels 6 to 12 mm. long, spreading-pubescent; petals blue or purple, rarely yellowish, fading brown, keel somewhat exposed, arcuate, ciliate on upper edges from middle to claws; pods dark brown, about 3 cm. long, ovules 7 to 10, seeds mottled with dark brown.—Open woods and thickets, cañons or hillsides: common in the Coast Ranges from Humboldt Co. to Los Angeles Co., occasional in the Sierra Nevada. Var. DÚDLEYI C. P. Sm. Densely villous with long spreading hairs; stems decumbent at base, 30 to 40 cm. tall; flowers 14 to 16 mm. long. —Montara Mts., San Mateo Co. Var. PARÍSHI C. P. Sm. Stouter and taller, 9 to 15 dm.; flowers 14 to 18 mm. long; keel ciliation longer and denser; seeds often larger, pale and obscurely marked.—Cañons of the Sierra Nevada from Butte Co. s.; s. to San Diego Co.; rare northward, reaching the Coast Ranges only in S. Cal. (near Parris Hill, San Bernardino Co., S. B. Parish 11,302, type). Var. LÓNGIPES (Greene) C. P. Sm. Stoutish, striate, lower, hardly fistulous; leaves mostly basal, persistent at flowering time, with petioles 30 to 50 cm. long; racemes lax; flowers 12 to 14 mm. long; keel ciliolate; seeds brown with a dark diagonal line.—Moist soil, evidently not common, Fresno Co. and n. to southern Oregon. (L. longipes Greene.) Var. COLÚMBIÀNUS (Hel.) C. P. Sm. Wing petals broader, outcurved on the lower free edges, covering all or most of the keel; plants 3 to 24 dm. tall; flowers 10 to 14 mm. long.—Mountain sides and along streams, only in the Sierra Nevada from Mariposa Co. n.; n. to Wash. (L. confusus Hel., not Rose. L. columbianus Hel.)

51. **L. tídestròmii** Greene. Densely appressed-pubescent, unbranched, decumbent, stems slender, 10 to 30 cm. long, roots bright yellow; leaves short-petioled, scattered, silvery-silky both sides, leaflets commonly 3, sometimes 4 or 5; verticils 1 to 5; flowers 11 to 13 mm. long, bracts early deciduous, pedicels slender, 3 to 5 mm. long, spreading-pubescent; petals blue, banner glabrous, the white or yellow center turning violet, keel arcuate, ciliate above; pods 20 to 25 mm. long by 4 to 6 mm. wide, succulent and terete when green, flat and yellow when dry, ovules 5 to 8, seeds dotted or marbled with black.—Sand dunes near Pacific Grove.

52. **L. littoràlis** Dougl. Appressed-silky and more or less villous, especially at the nodes, stems decumbent, slender, simple or branched, 10 to 40 cm. long, roots bright yellow; leaves usually short-petioled, leaflets 5 to 9, appressed-pubescent both sides, yet greenish; flowers 10 to 14 mm. long, verticillate or nearly so, bracts early deciduous, pedicels 3 to 6 mm. long, spreading-pubescent; petals blue, fading brownish, banner glabrous, keel arcuate, ciliate above; pods slender, about 30 mm. long by 5 to 6 mm. wide, dark brown, appressed-pubescent, ovules 9 to 14, seeds linear-oblong, mottled with brown or black.—Coastal sands, Del Norte Co.; n. to B. C.

53. **L. variícolor** Steud. Appressed-subsilky and more or less villous, the nodes and internodes equally hairy, greenish, stems usually branched, slender, decumbent or prostrate, 2 to 3 mm. thick, 2 to 8 dm. long; leaves usually long-petioled, appressed-pubescent or glabrate above, leaflets 7 to 9; flowers 11 to 16 mm. long, verticillate, bracts early deciduous, pedicels 4 to 6 mm. long, appressed- or spreading-pubescent; petals yellow, whitish, pinkish, bluish, or purple, the glabrous banner commonly paler than the wings, keel arcuate, ciliate above; pods 25 to 35 mm. long by 7 to 10 wide, dark brown, loosely- or appressed-pubescent, ovules 7 to 9, seeds mottled; roots not bright yellow.—Grassy fields and slopes near the coast, Monterey Co. to Humboldt Co. (L. versicolor Lindl., not Sweet. L. franciscanus and micheneri Greene.)

54. **L. rivulàris** Dougl. Appressed-subsilky and more or less villous, green, stems simple or branched, usually ascending or erect, but sometimes decumbent, often fistulose, 4 to 10 or more mm. thick, 3 to 9 dm. tall; leaves short-petioled, not crowded, leaflets 5 to 9, sparsely appressed-pubescent below, becoming glabrous above in age; flowers 12 to 16 mm. long, verticillate more or less, bracts early deciduous, pedicels 4 to 10 mm. long, spreading- or rarely

appressed-pubescent; petals blue or variegated, banner glabrous, usually with the apical portion yellow, keel arcuate, ciliate above; pods 3 to 5 cm. long by 6 to 10 mm. wide, dull yellow and dark brown, subappressed-hairy, ovules 8 to 12, seeds mottled, usually with prominent lateral lines.—Sandy or gravelly soil along or near streams, coastwise, Mendocino Co. and n. to western Wash. (L. lignipes Hel.)

55. **L. arbòreus** Sims. Appressed-pubescent to glabrate, rarely villous, branching shrub with a distinct trunk or rarely low and caespitose, 4 to 24 dm. tall; leaves short-petioled, leaflets 6 to 11, appressed-pubescent both sides or glabrate above; racemes 10 to 30 cm. long; flowers 14 to 18 mm. long, scattered or whorled, bracts early deciduous, pedicels 6 to 10 mm. long, spreading-pubescent; petals broad, commonly bright yellow, but sometimes lilac, blue, or violet, banner glabrous, keel curved, ciliate along upper edges; pods dark brown, appressed-pubescent, 5 to 8 cm. long by 8 to 12 mm. wide, ovules 8 to 12, seeds oblong, dark brown, unmarked or obscurely mottled, but with a pair of pale spots enclosing the micropyle.—Coastal sands and cañons, Humboldt Co. to Santa Barbara Co. (L. propinquus Greene.) Var. EXÍMIUS C. P. Sm. More or less villous, internodes of season's growth much shortened; leaves and flowers crowded; racemes usually only 5 to 10 cm. long; wings blue, banner largely yellow.—Exposed slopes near summit of Montara Mts., San Mateo Co. (L. eximius Davy.)

56. **L. longifòlius** (Wats.) Abrams. Appressed-pubescent, greenish subsilky, erect, stout, shrubby below, branched above, 8 to 15 dm. tall; leaves mostly short-petioled, crowded, leaflets 6 to 9, equally subsilky on both sides; racemes 20 to 40 cm. long; flowers 14 to 18 mm. long, scattered or more or less whorled, bracts deciduous, pedicels 4 to 10 mm. long, spreading-pubescent; petals blue or bluish, rarely yellowish, banner glabrous, keel more or less ciliate above, somewhat curved; pods dull yellow, 4 to 6 mm. long, ovules 6 to 8, seeds gray, variously mottled and with dark brown lateral lines.—Foothills and ocean bluffs, Los Angeles and San Bernardino Cos. to San Diego Co. (L. chamissonis var. longifolius Wats.)

57. **L. chamissònis** Esch. Minutely spreading-pubescent, often tomentose, erect branching shrub, 3 to 9 dm. tall; leaves short-petioled, axillary clusters well developed, petioles about 2 cm. long, leaflets 6 to 9, silky on both sides, 12 to 25 mm. long; flowers 12 to 16 mm. long, scattered or subverticillate, bracts early deciduous, long or short, pedicels 6 to 8 mm. long, spreading-pubescent; petals blue or lavender, banner with a yellow center, pubescent on the back near apex, keel arcuate, non-ciliate or nearly so; pods brown, sublanate, 30 to 35 mm. long by 8 to 10 mm. wide, ovules 6 to 7, seeds mottled or clouded with brown.—Coastal sand hills, San Francisco to Los Angeles Co. (L. chamissonis var. longebracteatus Wats.)

58. **L. álbifrons** Benth. Appressed-silky, arborescent, often with a distinct woody trunk, much branched, 6 to 15 dm. tall; leaves many, the lower often long-petioled, petioles mostly longer than their leaflets, leaflets 7 to 10, oblanceolate to spatulate or obovate, acute or rounded at apex, silvery-silky on both sides; racemes 8 to 30 cm. long; flowers 10 to 14 mm. long, largely verticillate, bracts early deciduous, more or less exceeding buds, pedicels 4 to 8 mm. long, spreading-pubescent; petals blue or purplish, banner more or less pubescent on the back near the apex, with white or yellow center early changing to violet, keel ciliate above along acumen only, narrowed toward the base; pods dull yellow, 3 to 5 cm. long by about 8 mm. wide, ovules 5 to 9, seeds variously mottled or spotted and usually with a marginal line.—Hillsides and cañons, abundant in the Coast Ranges and occasional in the Sierra Nevada foothills. Var. COLLÌNUS Greene. Low and caespitose; leaves crowded basally and petioles more elongated; flowers averaging larger; keel often practically non-ciliate.—Hills, San Francisco Bay region. (L. collinus Hel.) Var. DOUGLÁSII C. P. Sm. Floral bracts much exceeding buds; leaflets 35 to 60 mm. long, linear-oblanceolate to oblong-oblanceolate.—Mt. Tamalpais and hillsides s. of Monterey. (L. douglasii Agardh. L. fallax Greene.) Var. ÉMINENS C. P. Sm. Pedicels appressed-pubescent; flowers often 16 mm. long.—Interior foothills and cañons, Butte

Co. to L. Cal., reaching the coast southw. (L. eminens, tricolor and jucundus Greene. L. brittoni Abrams. L. acutilobus Hel.)

59. **L. sericàtus** Kell. Densely appressed-silky, usually unbranched, decumbent, 15 to 30 cm. tall; leaves long-petioled, silvery-silky both sides, rather scattered, leaflets 6 or 7, spatulate, rounded or retuse, 3 to 4 cm. long, mostly over 12 mm. wide; flowers 14 to 16 mm. long, scattered or subverticillate, bracts early deciduous, pedicels 4 to 5 mm. long, appressed-pubescent; petals purplish-blue, banner somewhat pubescent on the back, wings very broad, keel arcuate, ciliate on the upper edges and on the lower free margins near the claws; ovules 5 to 7, seeds light brown, more or less mottled.—Dry slopes of the higher mountains of the St. Helena and Mayacamas ranges.

60. **L. cervínus** Kell. Densely velvety-pubescent or subsilky, unbranched, subacaulescent, erect, 15 to 30 cm. tall; leaves long-petioled, crowded near the base, leaflets 5 to 8, appressed-silky both sides, ovate to lanceolate, obtuse or rounded at apex, 2 to 6 cm. long, 10 to 30 mm. wide; flowers 14 to 16 mm. long, more or less whorled, bracts early deciduous, pedicels 3 to 5 mm. long, spreading-pubescent; petals broad, banner more or less pubescent on the back, keel curved, ciliate above and near the claws below; pods appressed-silky, about 30 by 8 mm., ovules 6 to 8, seeds somewhat spotted and with a dark lateral line.—Dry pine lands, Santa Lucia Mts. (L. latissimus Greene.)

61. **L. excubìtus** Jones. Densely appressed-silky, 3 to 15 dm. tall, with persistent woody stems, more or less branched; leaves all long-petioled, lower internodes short, leaflets 7 or 8, oblong-oblanceolate to spatulate, 2 to 4 cm. long, densely silky on both sides; flowers in whorls which are well-separated below, 10 to 14 mm. long, bracts deciduous, pedicels 4 to 6 mm. long, appressed-pubescent; petals blue, more or less mixed with violet, yellow center of banner commonly changing to rich violet, glabrous or somewhat pubescent dorsally, wings broad, keel arcuate, ciliate above and sometimes near claws below; pods 3 to 5 cm. long, 8 to 10 mm. wide, ovules 6 to 8, seeds pale, obscurely marked except for a yellowish-brown lateral line on each side.—Gravelly washes and rocky slopes, Inyo and Ventura Cos. to L. Cal., rarely near the coast. Var. HÁLLII C. P. Sm. Usually larger and coarser, the flowers 14 to 18 mm. long.—Cañons and hillsides, Ventura and San Bernardino Cos. and s. to L. Cal. (L. hallii Abrams. L. paynei Dav.) Var. JÓHNSTONI C. P. Sm. A low subalpine congested shrub with the persistent woody branches seldom over 15 cm. long; racemes 6 to 12 cm. long; flowers 14 to 18 mm. long.—Dry mountain tops, Ventura and San Bernardino Cos. and s. Var. AUSTROMONTÀNUS C. P. Sm. Stems short, mostly herbaceous, the long-petioled leaves crowded at the base, with 1 to 3 reduced upper leaves; otherwise as in var. hallii.—Open fields or grassy desert slopes, Kern Co. to San Diego Co. (L. austromontanus Hel.)

62. **L. gráyi** Wats. Densely short-villous, usually unbranched, 20 to 35 cm. tall; cauline leaves short-petioled, scattered along stem, leaflets 5 to 9, oblanceolate, 25 to 35 mm. long, about 6 mm. wide, hairy on both sides; flowers 12 to 14 mm. long, more or less whorled, bracts early deciduous, pedicels 2 to 4 mm. long, spreading-pubescent; petals broad, banner with a yellow center, glabrous or somewhat pubescent dorsally, keel slightly arcuate, densely ciliate on the upper margins and often also on the lower edges near claws; pods appressed-pubescent, 25 to 30 mm. long by 6 to 8 mm. wide, dull yellow, ovules 4 to 6, seeds grayish-yellow, obscurely marked except for the dark lateral lines.—Cañons and valleys, Sierra Nevada from Plumas Co. to Fresno Co.

63. **L. obtusilòbus** Hel. Appressed-silvery-silky, 2 to 3.5 dm. tall, more or less decumbent to ascending; leaves silvery-silky both sides, petioles 3 to 4 cm. long, leaflets 5 to 7, 2 to 4 cm. long by 5 to 10 mm. wide; verticils 4 to 7, approximate; flowers 12 to 14 mm. long, spreading, bracts deciduous, pedicels 3 mm. long, loosely appressed-pubescent; petals blue or lilac, banner suborbicular, pubescent dorsally, with yellow center, keel more or less curved,

ciliate on upper edges above middle; pods silky, about 25 by 7 mm., ovules 4 or 5, matured seed not seen.—Peculiar to the higher peaks of n. Cal.: Mt. Shasta; Lassen Peak; Mt. Pleasant (Plumas Co.).

64. **L. magníficus** Jones. Sublanate and long-villous, erect, 6 to 12 dm. tall, acaulescent; leaves crowded at the base, petioles 15 to 20 cm. long, leaflets about 7, 30 to 40 mm. long by 6 to 10 mm. wide, hairy both sides; racemes 30 to 45 cm. long; flowers 16 to 18 mm. long, more or less verticillate, bracts deciduous, pedicels stout, 4 mm. long, spreading-pubescent; petals pinkish-purple, banner glabrous, the yellow center changing to dark purple, keel arcuate, yellow, ciliate on the upper edges of the short acumen; ovules 10, pods and seeds not seen.—Gravelly washes, Panamint Range. Var. GLARÉCOLA Jones. Flowers only 10 to 12 mm. long; pedicels slender, about 8 mm. long; racemes 20 to 30 cm. long.—Gravelly soil, Lone Pine, Inyo Co. Var. HESPÈRIUS C. P. Sm. About 2 dm. tall; flowers 13 to 15 mm. long; pedicels stout, about 4 mm. long; racemes about 10 cm. long; upper calyx-lip bifid, lower tridentate; keel straight.—Coarse sand, w. of Bishop, Inyo Co. (L. hesperius Hel.)

65. **L. saxòsus** Howell. Densely villous, low, stems abbreviated, plants 1 to 3 dm. tall; leaves largely basal, long-petioled, glabrous or sparsely subvillous above, appressed-silky below, leaflets 8 to 12, 12 to 30 mm. long; racemes 5 to 10 cm. long, densely flowered; flowers 14 to 18 mm. long, bracts deciduous, pedicels 4 to 6 mm. long, spreading-pubescent; petals blue, banner with yellow center, almost as wide as long, keel ciliate on upper edges; pods villous, ovules 4 or 5.—Stony fields and hilltops, Modoc Co.; n. to eastern Wash.

12. CÝTISUS L.

Shrubs. Leaves 3-foliolate. Flowers yellow or white. Calyx-tube campanulate, its limb (in ours) 2-lipped. Petals broad; keel obtuse. Stamens monadelphous. Pod flattened, several-seeded. (Greek Kutisus, a kind of clover.)

1. **C. scopàrius** Link. SCOTCH BROOM. Shrub 3 to 6 ft. high, with angular broom-like leafless branches or sparingly leafy; leaves palmate, the leaflets 2 to 4 lines long; flowers bright yellow, solitary or in pairs in the axils, forming leafy racemes; pods pilose along the margins.—Native of Eur., sparingly spontaneous: w. Sonoma Co.; Millbrae, San Mateo Co.

13. ÙLEX L.

Densely spiny shrubs with dark green almost leafless branches. Leaves reduced to spines or small scales. Flowers yellow, showy, axillary and often crowded at the ends of the branches. Calyx yellow, deeply 2-lipped. Stamens monadelphous. (Old Latin name of some similar plant.)

1. **U. europaèus** L. FURZE. GORSE. Two to 4 ft. high; pods villous, ½ in. long.—Near the coast, Marin Co. to Mendocino Co.; sparingly nat. from Eur.

14. MEDICÀGO L. MEDICK

Herbs, the leaves and flowers essentially as in Melilotus. Flowers in short spikes or loose heads. Stamens diadelphous, the upper one entirely free. Pod small, 1 to several-seeded, incurved or coiled or spirally twisted, indehiscent. (Greek Medike, name given by Dioscorides to a plant from Media, perhaps Lucern.)

Perennial; flowers blue ..... 1. *M. sativa.*
Annuals; flowers yellow.
  Pod 1-seeded, reniform, unarmed but strongly nerved ..... 2. *M. lupulina.*
  Pod several-seeded, spirally coiled,
    Margined with prickles.
      Edge of the pod keeled, not grooved between the prickles; leaflets not splotched ..... 3. *M. hispida.*
      Edge of the pod furrowed between the prickles; leaflets with a large inky splotch on the upper face ..... 4. *M. arabica.*
    Unarmed ..... 5. *M. apiculata.*

1. **M. sativa** L. ALFALFA. Perennial from an elongated taproot, erect and smooth; leaflets oblong-obovate or linear-oblong, 8 to 10 lines long; flowers

522. Medicago hispida Gaertn.; *a*, fl. branchlet x ½; *b*, fl. x 2½; *c*, pod x 2.

blue (5 lines long), in racemes; pod spirally twisted so as to form 2 or 3 complete rings or coils. — Borders of fields and in low valleys. Native of western Asia, cultivated for more than 20 centuries. Brought into California in 1854, it is our "King of Forage Plants," often producing ten tons of hay per acre per annum. It is also valued as a bee plant, sometimes yielding 60 lbs. of honey to the acre.

2. **M. lupulina** L. Nonesuch. Black Medick. Branching from the base into spreading procumbent stems 9 to 18 in. long; leaflets orbicular and more or less deltoid to cuneate-obovate, 4 to 6 lines long; peduncles longer than the leaves (1 to 1½ in. long), bearing a short dense spike of bright yellow flowers; pod reniform, 1-seeded, black when ripe.—Nat. from Eur., uncommon, but widely distributed. Apr.-June.

3. **M. hispida** Gaertn. Bur Clover. Fig. 522. Branches spreading or procumbent, from a few in. to 2 ft. long; herbage nearly glabrous; leaflets obovate or obcordate; stipules finely toothed; peduncles 3 to 5-flowered, rather longer than the leaves; pod twisted into a spiral of 2 or 3 turns, compressed, reticulated, the thin keeled edge bordered by a double row of more or less hooked or curved prickles.—Nat. from Eur.; very common throughout Cal. on the plains, low hills and in the valleys. Mar.-June, but flowering in moist places at nearly all seasons. By cattlemen it is prized as a dry season stock feed, since the burs are produced in great quantity and are highly nutritious; the plant also furnishes a green forage in spring. This is a rare instance of an aggressive immigrant having forage value.

4. **M. arábica** All. Spotted Medick. Very similar to no. 3, but the petioles with spreading hairs, the leaflets usually much larger (1 in. long); pod compactly spiral, the margin thicker.—Nat. from Eur.; San Francisco Bay region, uncommon.

5. **M. apiculàta** Willd. Stems spreading, 1 to 2 ft. long; leaflets deltoid, denticulate, except at the base, usually retuse and mucronate at apex, 5 to 6 lines long; pod unarmed or the spines very short, the sides strongly reticulated, the reticulations running to the edge and appearing as a row of tubercles on either side of the margin.—Nat. from Eur., widely distributed but rare.

15. MELILÒTUS Juss. Sweet Clover

Annual or biennial herbs with pinnately 3-foliolate leaves and toothed leaflets. Herbage fragrant in drying. Flowers small, yellow or white, in spike-like racemes on axillary peduncles, in bud erect, soon deflexed and not again becoming erect. Calyx 5-toothed. Petals falling after flowering, free from the stamen tube. Stamens diadelphous, the upper one entirely free. Pod ovoid, straight, longer than the calyx, scarcely dehiscent, 1 or 2-seeded. (Greek meli, honey, and lotos, the ancient name of some plant belonging to this family.)

Flowers white; plants 3 to 6 ft. high ..... 1. *M. alba.*
Flowers yellow; plants 1½ to 3 ft. high ..... 2. *M. indica.*

1. **M. álba** Desr. White Melilot. Erect, simple below, branching above; leaflets broadly or narrowly oblong, tapering to both ends, or widest above the middle, serrate except at the very base, ½ to 1¼ in. long; flowers 2 lines

long, in racemes 1 to 4 in. long; pod somewhat wrinkled. — Nat. from Eur.; stream bottoms throughout Cal., mostly toward the interior, or in moist valleys northw. It is cultivated for forage but cattle do not take kindly to it at first. July-Oct.

2. **M. índica** All. YELLOW MELILOT. Fig. 523. Main stem erect, with many rather spreading branches from above the base; leaflets broadly or narrowly cuneate-obovate, dentate or serrate but entire below the middle, truncate or retuse at apex, ½ to 1¼ in. long; racemes 1 to 2 in. long, longer than the peduncles; flowers 1½ lines long; pod with thinnish strongly wrinkled coat. — Nat. from Eur., common throughout Cal. Apr.-May. It is cultivated as a green manure plant.

523. Melilotus indica All.; *a*, fl. branchlet x 1; *b*, fl. x 5.

16. TRIFÒLIUM L. CLOVER

Herbs with palmate (or rarely short-pinnate) leaves; leaflets generally 3, sometimes 4 to 7; stipules foliaceous, united at the base and clasping the petiole. Flowers white, yellow, pink, red or purple, in heads. Heads capitate, sometimes loose (umbellate) or short-spicate. Calyx 5-toothed, the lobes equal or nearly so, entire or sometimes bifid or trifid. Petals withering and persistent. Stamens diadelphous. Pod globose to elongated, 1 to 8 (mostly 1 or 2)-seeded, included within the persistent calyx. (Latin tres, three, and folium, leaf.)

A. Heads with an involucre.

1. COROLLA CONSPICUOUSLY INFLATED; ANNUALS.

Involucre present.
- Involucral lobes 3 to 9 (commonly about 6 lines long); heads large; flowers cream-color or yellowish ..... 1. *T. fucatum.*
- Involucral lobes 2 lines long or less; heads small; flowers purple, reddish or white ... 2. *T. amplectens.*

Involucre reduced to a ring, or subobsolete ..... 3. *T. depauperatum.*

2. COROLLA NOT INFLATED (SOMEWHAT INFLATED IN NO. 13); ANNUALS EXCEPT NOS. 7 AND 11.

a. Involucre a flat or spreading disc with variously shaped margin (sometimes of separate segments).

Calyx-teeth dilated and either tridentate or simple.
- Plants strictly glabrous; stems commonly not fistulous.
  - Stipules erect ..... 4. *T. tridentatum.*
  - Stipules with the tips reflexed ..... 5. *T. polyodon.*
- Plants pubescent and clammy; stems fistulous ..... 6. *T. obtusiflorum.*

Calyx-teeth not dilated but subulate, entire.
- Heads large; stems commonly thick.
  - Flowers large, 6 to 7 lines long, purple to pinkish, lighter at the top; heads very densely flowered; perennial ..... 7. *T. involucratum.*
  - Flowers smaller (mostly 3 to 5 lines long), dark purple, cream-tipped; heads less densely-flowered; annual ..... 8. *T. appendiculatum.*
- Heads small and stems slender (except in T. variegatum var. melananthum).
  - Stipules with margin laciniately toothed or divided.
    - Corolla much longer than calyx; involucre with laciniately toothed lobes .... 9. *T. variegatum.*
    - Corolla little longer than calyx; involucre cleft nearly to base into deeply laciniate divisions ..... 10. *T. oliganthum.*
  - Stipules with margin entire or nearly so; corolla 2 to 3 times as long as calyx; involucre cleft to base or nearly so ..... 11. *T. monanthum.*

b. Involucre campanulate to bowl-shaped.

Lobes of involucre toothed.
Calyx-teeth many-forked, glabrous....12. *T. cyathiferum.*
Calyx-teeth all or all but one simple, hairy or ciliate.
Calyx-teeth awn-like, plumose, the upper one forked....13. *T. barbigerum.*
Calyx-teeth subulate, ciliate, all simple....14. *T. microdon.*
Lobes of involucre entire; calyx-teeth broadly subulate with scarious margins....15. *T. microcephalum.*

B. Heads naked or with involucre reduced to a vestigial ring or bract.

1. Flowers pedicellate.

a. Annuals; flowers in age reflexed.

Plants more or less pubescent.
Petioles shorter than the leaflets; terminal leaflet on a rachis 1 to 2 lines long, the lateral subsessile (leaves pinnate); flowers yellow.
Heads 3 lines broad; banner not dilated....16. *T. dubium.*
Heads 4½ to 5 lines broad; banner dilated....17. *T. procumbens.*
Petioles as long as or longer than leaflets; leaflets all subsessile at the same point (leaves palmate); flowers white to rose-pink; pubescence confined to peduncles and calyces....18. *T. bifidum.*
Plants strictly glabrous.
Calyx-teeth with bristled or ciliated margins; flowers light pink....19. *T. ciliatum.*
Calyx-teeth with entire margins; flowers rose-red to cream-color...20. *T. gracilentum.*

b. Perennials (or rarely biennials).

Leaflets 3; flowers in age reflexed.
Plants sparsely pubescent above.
Peduncles becoming recurved at apex; flowers cream-white....21. *T. breweri.*
Peduncles remaining erect; flowers tinged with pink.
Calyx-teeth twice as long as the tube; upper stipules toothed.22. *T. oreganum.*
Calyx-teeth little longer than the tube; stipules entire....23. *T. hybridum.*
Plants glabrous throughout.
Rachis commonly produced above the heads; leaflets mostly lanceolate to oblong-lanceolate, acuminate, spinulose-serrate....24. *T. kingii.*
Rachis not produced above the heads; leaflets broader, not acuminate, less deeply toothed.
Leaflets ¾ to 2½ in. long; stems erect or ascending, simple or nearly so, more or less leafy.
Plants ⅓ to 1 ft. high; leaflets ¾ to 1½ in. long; flowers red....25. *T. beckwithii.*
Plants 2 to 2¾ ft. high; leaflets 1½ to 2½ in. long; flowers white...26. *T. howellii.*
Leaflets not over ¾ in. long; leaves all or mostly basal.
Stems creeping, bearing erect or ascending leaves and petioles; flowers white or pink....27. *T. repens.*
Stems caespitose from the branching crown of a thick root; flowers lavender....28. *T. bolanderi.*
Leaflets 5 to 7 (rarely 3); flowers not reflexed (rarely so in no. 32).
Calyx densely silky-villous, the filiform segments plumose.
Heads exceeding the leaves; stipules ovate-oblong.
Stipules sparsely toothed; heads somewhat spicate; stem simple....29. *T. macrocephalum.*
Stipules entire; heads capitate-umbellate; caespitose, the stems and leaves matted, the naked peduncles erect....30. *T. monoense.*
Heads not exceeding the leaves; heads somewhat umbellate; stipules lanceolate, entire; stems matted....31. *T. andersonii.*
Calyx pubescent, the lanceolate or subulate-lanceolate segments not plumose.
Heads few-flowered; plant 1 to 3 in. high....32. *T. gymnocarpon.*
Heads many-flowered; plant 6 to 8 in. high....33. *T. lemmonii.*

2. Flowers sessile.

a. Annuals; flowers not reflexed.

Heads sessile in pairs, subtended by the stipules of the sessile upper leaves..34. *T. macraei*
Heads not sessile.
Corolla exceeding or about equaling the calyx.
Heads 7 to 12 lines wide, globose-ovate; corollas well-exserted; stem one from the base....35. *T. amoenum.*
Heads mostly 4 to 6 lines wide, cylindric or hemispheric to narrowly ovate; stems 1 to several from the base.
Corollas well-exserted....36. *T. dichotomum.*
Corollas barely or not at all exserted....37. *T. albopurpureum.*
Corolla much exceeded by the calyx, entirely obscured by the long-plumose calyx-teeth....38. *T. olivaceum.*

b. Perennials.

Heads sessile, subtended by the stipules of the sessile upper leaves; stipules scarious; flowers not reflexed....39. *T. pratense.*
Heads long-pedunculate; stipules foliaceous.
Peduncles strongly recurved in age; flowers reflexed....40. *T. eriocephalum.*
Peduncles remaining erect; flowers not at all reflexed, or only tardily..41. *T. longipes.*

1. **T. fucàtum** Lindl. SOUR CLOVER. Fig. 524. Stems stout, fistulous, succulent, diffuse, 1 to 2¾ ft. long; stipules large, broadly subulate, acuminate, the margins membranous; leaflets rhombic-ovate, 5 to 12 lines broad, broadly dentate, sometimes dentate-setate; heads large, 1 to 2 in. in diameter; involucre 5 to 9-lobed, its margins scarious, entire; flowers pedicellate; corolla cream-color tinged with light green, in age inflating and turning a deep pink; keel dark purple; calyx very small, scarious, the teeth short, unequal; pods stipitate, 3 to 8-seeded.—Low alkaline or brackish places, often on blue adobe, throughout cismontane Cal.; n. to Ore. It acts much like an alien weed, since abundant along railroad tracks and country roads. Possibly introd. from S. Am. Apr.-June. Var. VIRÉSCENS Jepson. Smaller; leaflets spatulate, pectinate to pectinate-dentate; calyx-teeth reduced to 3, longer than the calyx-tube; pod 3-seeded.—Dry hills, Napa Co. to Humboldt Co. Var. GAMBÉLLII Jepson. Procumbent and very succulent; leaflets rhombic, thick, glaucous; calyx-teeth very long, 2 to 3-cleft.—E. Contra Costa Co. Var. FLÁVULUM Jepson. Procumbent as in var. gambellii; leaflets small, rotund-obovate; calyx-teeth simple, equaling or exceeding the calyx-tube.—Widely distributed and abundant in marshy places near the sea-coast, San Mateo Co. to Napa Co.

524. Trifolium fucatum Lindl.; head. x 1.

2. **T. ampléctens** T. & G. Stems commonly several or many from the base, rather stout, decumbent or ascending, 6 to 15 in. high; herbage glabrous; leaflets obovate to oblanceolate, emarginate to truncate, cuneate at base, serrate, ¼ to ¾ in. long; heads 4 to 11-flowered; involucre 6 or 7-lobed, the lobes rounded to oblong, scarious-margined, entire or occasionally toothed, equaling or exceeding the calyx-teeth; corolla white or purple, inflated. — Rich soil, low plains and foothills: Great Valley; Coast Ranges. It intergrades to the varieties. Var. STENOPHÝLLUM Jepson n. comb. Stems more slender; leaflets linear to oblanceolate; involucral lobes oblong, entire. — Valley fields: Sacramento Valley and Napa and Sonoma Cos. to San Diego Co. (T. stenophyllum Nutt.) Var. DIVERSIFÒLIUM Jepson n. comb. Heads many (8 to 15)-flowered; involucre very small, 6 to 9-lobed, the lobes ⅓ line long.—Salt marshes and alkaline soil, Contra Costa Co. to San Luis Obispo Co. (T. diversifolium Nutt.) Var. TRUNCÀTUM Jepson n. comb. Leaflets ¾ to 1 in. long; heads with the flowers in 2 whorls (rarely 1), the inner whorl subtended by a very small involucral ring. — Plains and mesas, coastal S. Cal. and n. to Marin Co. and the Sacramento Valley. (T. truncatum Greene.)

525 Trifolium depauperatum Desv.; *a*, fl. branchlet x 1; *b*, fl. with inflated corolla x 2.

3. **T. depauperàtum** Desv. Fig. 525. Stems slender, ascending, 4 to 8

526. Trifolium tridentatum Lindl.; *a*, fl. branchlet x ½; *b*, involucre x 1½; *c*, calyx spread open x 2; *d*, variations of calyx-lobes x 2.

in. high; herbage glabrous; leaflets cuneate-emarginate, denticulate, 3 to 5 lines long; peduncles slender, wiry; heads loose, 2 to 7-flowered, subtended by an exceedingly small or reduced involucral ring; corolla whitish to purple, becoming inflated, the banner enclosing the small wings and keel; pods stipitate, 2 to 6-ovuled, commonly 2-seeded.—Alkaline areas of valleys or flats in the hills, 25 to 2500 ft.: Great Valley, Sierra Nevada foothills; Coast Ranges from Humboldt Co. to S. Cal.; n. to Ore.; Chile. Var. LACINIÀTUM Jepson. Leaflets laciniately toothed or lobed.—Subsaline flats: e. Contra Costa Co.; Marin, Napa and Colusa Cos. Var. ANGUSTÀTUM Jepson. Leaves narrowly linear, entire or dentate, 5 to 6 lines long.—E. Contra Costa Co.; Sonoma and Napa Cos.

4. **T. tridentàtum** Lindl. TOMCAT CLOVER. Fig. 526. Stems several from the base, erect or ascending, 4 to 20 in. high; stipules laciniate-toothed, erect; leaflets linear-oblong to lanceolate, serrate-setate to entire, ½ to 1⅜ in. long; heads hemispherical, broader than long, ¾ to 1⅜ in. broad, the flowers standing out conspicuously, the wings protruding at right angles from the tube-like fold of the banner; involucre more or less deeply cleft into narrow lanceolate lobes; calyx-teeth usually tridentate, shorter than the calyx-tube; corolla bright to light purple, often white-tipped.—Valleys, hill slopes and cañon sides, 50 to 4000 ft., throughout cismontane Cal.; also Modoc and Siskiyou Cos.; n. to B. C. Our most abundant and widely distributed clover, exhibiting many ecological variations. Var. SÉGETUM McDer. Stems hollow, 4 to 5 lines thick, often 2 ft. high; leaflets 2⅝ in. long, 9 lines wide; heads broadly conical; flowers large, the tridentate calyx-teeth long, acicular.—San Francisco Bay region, abundant; the largest and most luxuriant variety. Var. ACICULÀRE McDer. Erect; peduncles short (1 to 4 in. long); divisions of involucre unequal, long-acicular, or the involucre reduced; calyx-teeth dilated, simple, becoming abruptly acicular.—Cismontane Cal., widely distributed.

5. **T. polỹodon** Greene. Stems flaccid, 1 to 1⅓ ft. high; stipules laciniate, the margins reflexed; leaflets obovate, serrulate, 3 to 11 lines long; involucre not deeply lobed, each lobe many-toothed; heads 4 to 7 lines broad; flowers dull purple, fading to white at the top; calyx turbinate, 10-nerved, reticulate, the teeth tridentate or multifid; pod 2-seeded; seeds brown-speckled.—Local at Pacific Grove and Monterey.

6. **T. obtùsiflòrum** Hook. CREEK CLOVER. Stems stout, erect, fistulous, 12 to 17 in. high; herbage clammy-hispidulous throughout; leaflets obovate-oblanceolate or oblanceolate, obtuse or acute, fringed-serrate, ¾ to 1½ in. long; peduncles 1 to 3 in. long; heads large; involucre small; calyx-teeth entire, dilated near base; corolla white with a bright purple spot at the center.—Moist swales or creek bottoms, widely distributed throughout cismontane Cal., 300 to 3700 ft., but rare as compared with its relative T. tridentatum; n. to southwestern Ore. The clamminess of the entire plant, even on dry summer days, makes it easily recognizable.

7. **T. involucràtum** Ort. COW CLOVER. Fig. 527. Stems thick but flaccid, low-caespitose or tall (4 to 24 in. high); herbage strictly glabrous; petioles long; small leaflets obcordate or obtuse-oblanceolate, about 2 to 3 lines long; large leaflets oblong, ovate, obovate or rhombic-oblanceolate, serrulate-setate, mostly obtuse, about 5 to 14 lines long; heads large, showy, ¾ to 1⅛ in. broad, each whorl often subtended by a secondary involucre; involucre deeply or slightly lobed, each lobe 3 to 5-toothed; calyx 10-nerved; corolla purple, rose-red or pinkish, lighter at the top; pod 2 to 6-seeded.—Frequent along streams, by springs or in salt-marshes, 10 to 8000 ft., throughout Cal. from the coasts to the deserts and in the mountains. Apr.-June. Var. FIMBRIÀTUM McDer. Leaflets spinulose-margined, acute, recurved at tip (in extreme form), 1 to 1¼ in. long; involucre divided into entire subulate divisions.—Wet meadows and margins of streams, 4000 to 7500 ft.: Sierra Nevada from Tulare Co. to Lassen and Siskiyou Cos.; n. to B. C. (T. spinulosum Dougl.) Var. FÉNDLERI McDer. Leaflets oblong, rounded at apex; calyx with one tooth slightly longer.—East side Sierra Nevada in Mono Co.; e. to Col. and N. Mex. Var. KÉNNEDIÀNUM McDer. Involucre extremely small (1 to 2 lines broad), scarious.—Sand-dunes, Del Norte Co.

527. Trifolium involucratum Ort.; *a*, fl. branchlet x ½; *b*, involucre x 1; *c*, fl. x 1½.

8. **T. appendiculàtum** Loja. Stems erect or diffuse, thick and fistulous or sometimes slender, 3 to 17 in. long; glabrous; stipules reflexed or spreading, irregularly laciniate; leaflets broadly obovate, obtuse or retuse, 2 to 8 (or 14) lines long; involucre 7 to 9-lobed, the lobes 3 to 5-toothed; heads mostly large and showy (5 to 12 lines broad); corolla dark-purple, cream-tipped; beak of keel long-apiculate.—Grassy slopes, Mendocino and Humboldt Cos.; Pacific Grove. Rare. May-June. Var. ROSTRÀTUM Jepson n. comb. Dwarf, 3 to 4 in. high; leaflets small, obcordate, on long filiform petioles; involucre 4-lobed, each lobe 3 or 4-toothed; heads small, few-flowered; keel rostrate.—Marin and Alameda Cos. (T. rostratum Greene.)

9. **T. variegàtum** Nutt. WHITE-TIP CLOVER. Stems slender, often several from the base and freely branching, decumbent or ascending, ½ to 2 ft. high; herbage strictly glabrous; stipules ovate, laciniately toothed; leaflets commonly obovate, sometimes oblong-oblanceolate, very small to large (2 to 7 lines long); peduncles slender; heads irregularly subglobose, 3 to 6 lines broad, few to many-flowered; involucre much smaller, 4 to 12-lobed, the lobes 3 to 7-toothed; flowers small; corolla purple, white-tipped or purple throughout; calyx 5 to 20-nerved, its teeth subulate-setaceous, often purple, simple or one tooth bifid.—Low or moist places, 20 to 4000 ft., widely distributed and common throughout cismontane Cal.; n. to B. C. Var. PAUCIFLÒRUM McDer. Dwarf, caespitose or the stems short and slender (1 to 6 in. long); leaflets very small; heads small (2 to 3 lines long), of 1 to 7 small purplish flowers; involucre 1 to 4-lobed, the lobes 3 to 5-toothed.—Montane, 2000 to 9000 ft.: Coast Ranges; Sierra Nevada. The smallest clover of western N. Am. Var. TRILOBÀTUM Jepson. Slender, 4 to 8 in. high, sparsely branched at the base; margin of stipules laciniate; petioles slender, 1⅕ to 2 in. long; leaflets lanceolate, acute at each end or often remarkably trilobate at apex; heads on long slender peduncles; lobes of involucre deeply and

laciniately toothed; flowers long; corolla dark purple, cream-color at the tips; calyx-teeth slender, acute, generally purple-tinted; pods 2-seeded.—Marysville Buttes. Var. MELANÁNTHUM Greene. Leaflets large, oblanceolate to oblong or obovate, obtuse, ½ to 1 in. long; heads ¾ to 1⅛ in. broad, large-flowered, showy; involucre small; calyx-teeth pungent and purple-tipped.—Common in low moist places, attaining a luxuriant growth: Coast Ranges and Great Valley.

10. **T. oligánthum** Steud. Stems slender, sparsely leafy, with long internodes and long peduncles, 4 to 16 in. high; herbage light green, glabrous, or the stipules and involucres sparsely pubescent; leaflets linear to cuneate-oblong, serrate-setate to entire, 3 to 9 lines long; peduncles 1 to 3¾ in. long; heads very small (2½ to 3 lines high), 3 to 15-flowered; involucre small, divisions deeply laciniate and unequal; flowers small; corolla lavender, white-tipped; keel purple; calyx-teeth broadly subulate, dark green; pod 2 or 3-seeded.—Wooded cañons and brush-covered slopes, 25 to 3500 ft.: Coast Ranges from San Luis Obispo Co. to Lake and Humboldt Cos.; Calaveras Co. to Butte Co.; n. to B. C.; not common. Mar.-June. Var. TRICHÓCALYX McDer. Peduncles and heads covered with a white pubescence; leaflets obcordate or rhombic, 1½ to 5 lines wide, 2 to 8 lines long.—Pacific Grove.

528. Trifolium monanthum Gray; *a*, habit x ½; *b*, fl. x 1¼; *c*, leaf x 1¼.

11. **T. monánthum** Gray. CARPET CLOVER. Fig. 528. Stems slender, erect or decumbent, 1 to 4 in. high; herbage sparingly villous with long scattered hairs or glabrous; stipules lanceolate, entire or nearly so; leaflets ovate to oblanceolate, 1 to 4 lines long, mostly retuse, sparingly toothed; heads 1 to 4-flowered; involucre very small, 2 to 3-parted and often unilateral, the lobes bifid; corolla 4 to 6 lines long, white or sometimes purplish, about 3 times as long as the short calyx; calyx-teeth subulate, shortly acuminate, thin.—Moist meadows and springy places, 5000 to 10,000 ft.: San Jacinto and San Bernardino mountains; Sierra Nevada from Tulare Co. to Amador Co.; w. Nev. June-Aug. Var. PÁRVUM McDer. Stems many from the base, diffuse or decumbent, 4 to 12 in. high, herbage conspicuously pubescent; involucre very small but extending to the base of the calyx-teeth.—Sierra Nevada from Fresno Co. to Placer Co., 3500 to 9000 ft. Var. TÉNERUM Parish. Stems 4 to 6 in. high, rather conspicuously villous; leaflets oblanceolate, acute; heads mostly 3 to 6-flowered; involucre divisions laciniate almost to the base.—Montane, sandy banks of streams, 6500 to 7000 ft., Fresno Co. to Tulare Co. Var. GRANTIÀNUM (Hel.) Parish. Glabrous, bright green; petioles 3 to 4 times longer than the leaflets; leaflets 4 to 8 lines long; flowers 5 to 6 lines long.—Montane, 5200 to 10,000 ft., San Jacinto and San Bernardino mountains. (T. grantianum Hel.)

12. **T. cyathíferum** Lindl. MOUNTAIN CLOVER. Stems erect or decumbent, 3 to 12 in. long; herbage strictly glabrous; leaflets narrowly obovate to elliptic-oblong, 5 to 12 lines long; involucre membranous, bowl-shaped, 5 to 10 lines broad, the lobed margin unequally toothed; corolla white or light pink, soon turning brown; calyx-teeth 1 to 3 times trichotomously forked.—Valleys or hillsides, 50 to 6000 ft.: North Coast Ranges from Lake Co. to Humboldt Co.; Sierra Nevada from Placer Co. n. to Modoc Co.; e. to Nev., n. to Ida. and B. C.

13. **T. barbígerum** Torr. Stems several from the base, procumbent, spreading in a circle, 3 to 8 in. long; peduncles erect, slender, wiry, pubescent to glabrous; stipules ovate-lanceolate, scarious, the upper portion green; leaflets rhombic or deltoid to ovate-oblong, setate-serrulate, 3 to 4 lines long; in-

volucre large, almost enclosing the flowers; calyx surpassing the corolla, its teeth plumose, setaceous, the lower tooth once or twice forked; corolla rose-red, the banner inflated; pods 2-seeded.—Low hills: near the coast from Monterey Co. to Del Norte Co.; Calaveras Co. Apr.-June. Var. ANDRÈWSII Gray. Villous-pubescent throughout, less procumbent and larger than the species; heads large; involucre villous-pubescent on both surfaces, 10 to 16-lobed, the lobes flabellate; flowers large, purple or lilac, the showy corollas much longer than the calyx.—Near the coast, Mendocino to San Luis Obispo. Rare.

529. Trifolium microdon H. & A.; *a*, fl. branchlet x ½; *b*, involucre x 1½; *c*, fl. x 3½.

14. **T. microdon** H. & A. Fig. 529. Stems stout, erect, ⅓ to 2 ft. high; herbage pilose; leaflets broadly obcordate or oblanceolate, serrate-setate, 5 to 9 lines long; stipules ovate-lanceolate; involucre deeply campanulate, becoming flattened at anthesis, 5 to 15-lobed; lobes prominent, green, 3 to 7-toothed; flowers small; corolla white or turning light pink; calyx-teeth short, abruptly subulate, scarious and ciliate-margined; pods 1-seeded.—Hillsides and valleys, Coast Ranges from San Luis Obispo Co. to Solano and Mendocino Cos.; n. to B. C.; S. Am. Var. PILÒSUM Eastw. Smaller; more or less woolly pubescent. —San Nicholas Isl.

15. **T. microcéphalum** Pursh. Stems slender, ascending, ⅓ to 2 ft. high; herbage soft-pubescent to nearly glabrous; stipules ovate, acuminate; leaflets obcordate to oblanceolate, retuse, serrate, 3 to 6 lines long; involucre 7 to 10-lobed, the lobes lanceolate, entire with scarious web-like margins; heads small, compact, 3 to 5 lines high; flowers small; corolla light pink or white; calyx shorter to slightly longer than corolla, the teeth entire, pungent, the margin below with a broad scarious border; pods 1 or 2-seeded.—Hillsides and valleys, common throughout cismontane Cal.; n. to B. C. Mar.-May.

16. **T. dùbium** Sibth. SHAMROCK. Stems slender, 1 to many from base, erect or ascending, ½ to 1½ ft. long, pubescent above; leaflets obovate or cuneate, denticulate, often emarginate, 3 to 4 lines long, on very short petioles; heads small (3 lines broad), the rachis elongated; flowers very small, in age reflexed; corolla yellow; pods 1-seeded.—Nat. from Eur.: Humboldt Co. (frequent); Crescent City; Nevada City. May-June.

17. **T. procúmbens** L. HOP CLOVER. Stems slender, decumbent or ascending, 6 to 13 in. long, finely appressed-pubescent; leaflets elliptic-obovate, often emarginate, 3 to 9 lines long, longer than the petioles; heads globose or a little elongate, 4 to 5 lines long; flowers in age reflexed; corolla bright yellow, standard very broad.—Introd. from Eur., sparingly established: Potato Cañon, San Bernardino Mts.; Humboldt Co. (Eureka; Korbel). June.

18. **T. bifidum** Gray. PINOLE CLOVER. Stems erect, very slender, 7 to 17 in. high; stipules ovate-lanceolate, setaceously acuminate, entire; leaflets remarkably bifid, that is ⅓ to ½ their length, often with a prominent mucro in the notch, the lobes coarsely toothed at apex; leaflets of upper leaves 5 to 11 lines long; peduncles pubescent at base of heads; heads small, the flowers

in age reflexed; calyx pubescent; corolla purple or pale pink, banner characteristically patterned by the peculiar venation.—Open hills and valleys, 100 to 1500 ft.: coastal S. Cal.; Coast Range hills from Santa Clara Co. to Humboldt Co.; Sacramento Valley; Sierra Nevada foothills from Mariposa Co. to Shasta Co.; infrequent in the typical form. May-June. Var. DECÍPIENS Greene. Leaflets linear-cuneate to obcordate, entire or slightly emarginate at apex.—More common than the species; Santa Barbara Co. to Humboldt Co., thence e. to the Great Valley and n. Sierra Nevada foothills.

530. Trifolium ciliatum Nutt.; *a*, fl. branchlet x ½; *b*, calyx spread open x 3½; *c*, fl. x 2.

19. **T. ciliàtum** Nutt. TREE CLOVER. Fig. 530. Stem stout, erect, fistulous, 1 to 2 ft. high; herbage glabrous throughout; stipules large, ovate-lanceolate, the margins scarious; leaflets oblong or oblong-ovate, obtuse, entire to serrulate, ½ to 1½ in. long; heads conical, the flowers reflexed in age; rachis often projecting through the head as a sterile point 1 to 5 lines long; corolla pinkish-purple; calyx-teeth remarkably ciliate; banner inflated at base, tapering toward the apex; pods 1 or 2-seeded.—Plains, valleys and foothills, 50 to 5000 ft., throughout cismontane Cal.: n. to Wash. (T. ciliolatum Benth.)

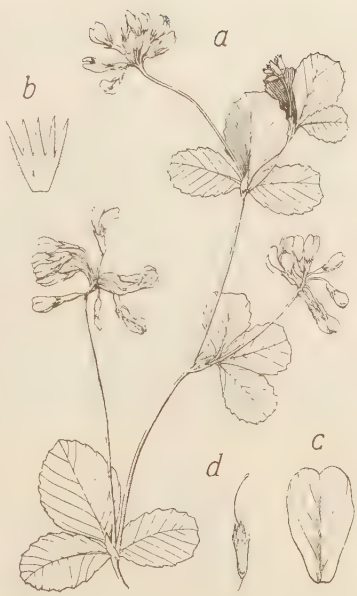
20. **T. graciléntum** T. & G. PIN-POINT CLOVER. Fig. 531. Stems slender, erect, spreading or procumbent, 5 to 20 in. long; herbage glabrous; stipules ovate-lanceolate; leaflets obovate, retuse at apex, 3 to 6 (or 9) lines long; heads numerous, small, 3 to 5 lines long, with the flowers reflexed in age, the rachis projecting; calyx-teeth subulate, entire, shorter than the reddish purple to light pink corolla; pod 1 to 2-seeded.—Valleys and foothills, 50 to 2500 ft.: coastal S. Cal.; Coast Ranges; Great Valley; Sierra Nevada foothills; n. to Wash. Common throughout the coast counties. Mar.-May. Var. INCONSPÍCUUM Fer. Smaller but like the species in habit; stems 4 in. high or less; flowers light purple to white; banner broader.—Common throughout coastal S. Cal. and w. Cal. The leaves exhibit a variety of beautiful markings from tiny white spots to red, brown and purple. Var. PÁLMERI McDer. Leaflets large, lanceolate, abruptly acute at tip, the margins serrate-setate; corolla purple to pink.—Santa Barbara Isls. Apr.

531. Trifolium gracilentum T. & G.; *a*, habit x ½; *b*, fl. x 2.

21. **T. bréweri** Wats. FOREST CLOVER. Fig. 532. Stems slender, erect or diffuse, 6 to 14 in. high; herbage pubes-

cent, glaucous; leaflets obovate, notched or obtuse at apex, coarsely dentate, 3 to 7 lines long; heads small, loose, peduncles curved at apex in age and pedicels retrocurved so that the flowers at last stand almost horizontally (i. e. at right angles to the straight portion of the peduncle); corolla cream-white to deep pink.—Open forest, 3000 to 6500 ft.: Sierra Nevada from Mariposa Co. to Plumas and Butte Cos., thence westerly to Trinity Co.; n. to southwestern Ore. June-Aug.

22. **T. oréganum** Howell. Stems slender, 3 to 8 in. high, these and the chiefly basal leaves in a dense tuft on the root-crown; herbage glabrous to glabrate; stipules ovate, acuminate, the upper ones toothed, the lower entire; leaflets oblanceolate to obovate, serrulate, mucronate, 3 to 11 (or 15) lines long; peduncles 1¼ to 3½ in. long; heads a little spicate, ¾ to 1¼ in. long; flowers 6 to 7 lines long, the short pedicels reflexed in age; corolla pinkish or light red; calyx-segments subulate, twice as long as the tube.—Moist gravelly open slopes, 5000 ft., Buck Mt., Humboldt Co.; n. to Ore. June-July.



532. Trifolium breweri Wats.; *a*, fl. branchlet x ¾; *b*, calyx spread open x 2; *c*, banner x 2; *d*, pistil x 3.

23. **T. hỳbridum** L. ALSIKE CLOVER. Stems short (4 to 12 in. high); herbage sparsely pubescent, or subglabrous; leaflets large, ovate to orbicular, ¾ to 1⅛ in. long; pedicels pubescent; calyx sparsely pubescent with appressed hairs, or glabrous, or a little hairy in the sinuses; corolla light pink.—Nat. from Eur. in mountain meadows: Sierra Nevada; Humboldt and Siskiyou Cos. Closely related to T. repens but a much stouter plant.

533. Trifolium kingii Wats.; *a*, leaf x ½; *b*, fl. branchlet x ½; *c*, calyx spread out x 3½.

24. **T. kíngii** Wats. Fig. 533. Stems rather slender, ascending, 4 to 15 in. high; leaflets lanceolate to oblong-lanceolate, acuminate, the lower rounded or obovate, spinulose-serrate, ½ to 1¼ (or 2) in. long; stipules broadly lanceolate, entire, ¼ to ½ as long as the leaflets; heads slightly elongate, 5 to 7 lines long; flowers 5 to 6 lines long, early deflexed, the end of the rachis produced as a sterile point; corolla rose-color or purple; calyx-segments subulate, longer than the tube.—Moist cañon bottoms, 5500 to 6500 ft., Nevada Co. to Siskiyou and Lassen Cos.; e. to Utah, n. to Mont. June.

25. **T. beckwíthii** Brew. Stems stout, erect or ascending, 4 to 12 in. high; stipules lanceolate to ovate, entire; leaflets narrowly to broadly oblong, mostly obtuse, serrate, ¾ to 1½ in. long; heads

globose, 1 to 1½ in. long; flowers 6 to 8 lines long, reflexed in age; corolla red; calyx-teeth linear-subulate, straight, equaling the tube; ovary smooth, 2 to 6-ovuled.—Mountain valleys and meadows, 4000 to 6000 ft., n. Sierra Nevada from Nevada Co. to Modoc Co.; n. to eastern Ore. and southern Ida., e. to Nev. June-July.

26. **T. howéllii** Wats. Stems stout, erect, nearly simple, 2 to 2¾ ft. high; stipules large, foliaceous, ovate; leaflets elliptic to elliptic-ovate, 1½ to 2½ in. long; heads ovate or oblong, ½ to ¾ in. long, the flowers on reflexed pedicels; corolla white.—Cañon creeks, 4000 to 5000 ft., Humboldt Co. to Siskiyou Co.; n. to Ore. July-Aug.

27. **T. rèpens** L. WHITE CLOVER. Stems creeping, bearing erect or ascending leaves and petioles; peduncles 2 to 9 in. high, much exceeding the leaves; herbage glabrous; leaflets broadly obcordate, 4 to 9 lines long; stipules ovate-lanceolate, acute; heads globose, 8 to 14 lines broad, the flowers completely reflexed in age; corolla white; calyx-teeth short, subulate, entire.—Nat. from Eur.; moist meadows, Sierra Nevada and Humboldt Co.

28. **T. bolánderi** Gray. Plants 4 to 9 in. high, the numerous stems decumbent or ascending, caespitose on the branched root-crown, sparsely leafy, the leaves mostly basal; leaflets obovate or somewhat rhomboidal, slightly serrulate, 3 to 8 lines long; peduncles slender, elongated, occasionally axillary, 2 to 5 in. long; heads small (5 to 6 lines long), the flowers relatively few, reflexed; corolla lavender; calyx-teeth lanceolate, scarcely equaling the tube; ovary smooth, 2-ovuled.—Mountain meadows, 7000 to 7100 ft., Sierra Nevada from Mariposa Co. (Westfalls Mdw.) to Fresno Co. (North Fork Kings River); very rare. June-July.

534. Trifolium macrocephalum Poir.; *a*, habit x ½; *b*, fl. x 1.

29. **T. macrocéphalum** Poir. BIG-HEAD CLOVER. Fig. 534. Stem stout, simple, 4 to 9 in. high; herbage somewhat villous; stipules large, ovate-oblong, sparsely serrate; leaflets cuneate-oblong to obovate, obtuse, serrulate, mucronate, 3 to 8 lines long; heads mostly terminal, globose-ovate, 1¼ to 1½ in. broad; corolla ⅞ to 1⅛ in. long, purplish; calyx half as long, the teeth subulate, plumose, 3 to 4 times as long as the tube; pod stipitate, 6-ovuled, smooth.—Shasta, Siskiyou and Modoc Cos.; e. to Nev., n. to B. C. Rather rare. Apr.-June.

30. **T. monoénse** Greene. Caespitose dwarf 2 to 3½ in. high, the leaves and peduncles matted on the branching root-crown; herbage thinly pubescent; leaflets narrow-obovate, abruptly acute, entire, 3 to 5 lines long; stipules membranous, conspicuously crowded on the ends of the root-crown branches; peduncles 1½ to 2¾ in. long; heads 8 to 9 lines broad, a little broader than high; calyx-teeth densely hairy.—High montane, 10,000 to 12,000 ft., White Mts., Inyo Co.

31. **T. andersònii** Gray. Caespitose dwarf 2 to 4 in. high, forming dense leafy tufts or mats on the stout root-crown; herbage densely silky- or rusty-villous; leaflets oblanceolate to cuneate-oblong, 4 to 11 lines long, abruptly short-acute or mucronate, entire or nearly so; peduncles mostly axillary, shorter than the leaves; heads subglobose, ¾ to 1¼ in. broad, subtended by a scarious vestige of an involucre; flowers 6 to 8 lines

long; corolla purplish; calyx-teeth filiform, plumose, a little shorter than the petals; pods tomentose, about 5-ovuled, 1 or 2-seeded. — Mountain slopes, 3500 to 8000 ft., n. Sierra Nevada from Sierra Co. to Shasta and Modoc Cos.; e. to Nev. June-July.

32. **T. gymnocárpon** Nutt. Dwarf, caespitose, 1 to 3 in. high, the leaves and peduncles arising from the shortly branched root-crown; herbage white-pubescent; stipules thin and scarious, forming conspicuous persistent sheaths to the branches of the root-crown; leaflets 3 to 5, obovate to elliptic, markedly serrate, 4 to 6 lines long; heads loosely few-flowered, surpassed by the leaves; calyx pubescent, its teeth lanceolate, about equaling the tube; corolla yellowish-white or reddish, 3½ to 4 lines long, 1½ to 2 times as long as the calyx; pods very short and thick, 1 or 2-seeded.—Plains and valleys, 5300 to 5500 ft., Plumas Co. to Modoc Co.; e. to Col. June.

33. **T. lemmònii** Wats. Stems rather slender, 6 to 8 in. high, from a thick root; stipules ovate, acuminate, coarsely toothed; leaflets obovate, obtuse, mucronate, coarsely toothed, 3 to 6 lines long; peduncles mostly terminal, far exceeding the leaves; heads 10 to 13 lines broad; flowers numerous, 4 to 7 lines long; calyx-tube pubescent, 2 lines long, the teeth subulate, nearly equal; corolla bright yellow; banner strongly hooded; ovary slightly pubescent, 2-ovuled.—Eastern crests and slopes of the n. Sierra Nevada, 5000 to 7000 ft., from Sierra Co. to Lassen Peak. June-July.

34. **T. macràei** H. & A. Stems several from the base, spreading or stout, often wiry, 4 to 12 in. long; herbage softly pubescent throughout; leaflets obovate, 4 to 6 lines long; heads sessile in pairs, subtended by the stipules and sessile leaves, 4 to 6 lines high; corolla purple, as long or longer than the plumose calyx.—Along the coast, Del Norte Co. to S. Cal.

35. **T. amoènum** Greene. Stem stout, erect, commonly one from the base, dichotomously branched only above, ⅓ to 2 ft. high, few-headed; herbage more or less densely pubescent; leaflets broadly obovate, about 1 in. long; leaves subsessile; heads globose-ovate, densely-flowered, 1 to 1⅓ in. long, on peduncles 1½ to 4½ in. long; peduncles straight; corolla purplish, tipped with white.—Valley fields, Marin and Sonoma Cos. to Solano Co.; rare. May-June.

36. **T. dichótomum** H. & A. Indian Clover. Fig. 535. Stems erect or ascending, 6 to 16 in. high; herbage sparsely to densely pubescent; stipules small, ovate-acuminate; petioles slender; leaflets ovate to elliptical or cuneate-obovate, 4 to 11 lines long; heads cylindric to ovate-cylindric, most commonly a little spike-like, truncate at top, turbinate at base, 6 to 12 lines long; peduncles 2 to 6 in. long, curved or retrocurved at apex; corolla cream-tipped, longer than the calyx; pods 1-seeded.—Locally gregarious, covering patches a rod square or so, low hills, Santa Cruz Co. to Contra Costa, Solano and Napa Cos.; rather uncommon. (T. californicum Jepson.) Var. turbinàtum Jepson. Three to 6 in. high; heads narrowly or broadly turbinate, sometimes broadly ovate, 4 to 8 lines high; corollas longer than the calices. — Mountain slopes: Humboldt Co.; Mt. St. Helena; Mt. Tamalpais; Mt. Hamilton; Hepsedam Peak. (T. petrophilum Hel.)

535. Trifolium dichotomum H. & A.; *a*, habit x ⅓; *b*, fl. x 2; *c*, pod x 3.

37. **T. álbopurpùreum** T. & G. RANCHERIA CLOVER. Stems slender, ascending or slightly decumbent, 8 to 16 in. high; heads hemispherical, or somewhat elongated, 4 to 7 lines long, the terminal single, on long peduncles, the lateral on short peduncles; leaflets obovate to cuneate-oblong, obtuse, 3 to 7 (or 12) lines long; corolla dark purple, barely or not at all longer than the calyx-teeth; pods 1 or 2-seeded. — Valleys and hillsides, 20 to 3000 ft.: Coast Ranges from Siskiyou Co. to San Luis Obispo Co. and s. to San Diego Co.; less common in the Sierra Nevada foothills from Butte Co. to Kern Co.; n. to Wash. Apr.-May. Var. NEOLAGÒPUS McDer. Stems rigid, 12 to 16 in. high; corolla as long as or slightly longer than the calyx.—Coast Ranges from Humboldt Co. to w. Kern Co.

536. Trifolium olivaceum Greene; *a*, fl. branchlet x ½; *b*, fl. x 2.

38. **T. olivàceum** Greene. Fig. 536. Stems erect or ascending, 8 to 12 in. high; herbage pubescent and glaucous throughout; leaflets cuneate-obovate, serrulate, 4 to 12 (or 15) lines long; peduncles stout; heads broadly ovate to hemispherical, subtruncate to turbinate at base, bright olive-green, 6 to 10 lines high; flowers completely hidden by the long and pubescent calyx-teeth; calyx-tube 1 to 1½ lines long, conspicuous at the base of the heads; corolla whitish and purplish; pods glabrous, 1-seeded.—Low hills and valley fields, Butte and Colusa Cos. to Marin Co. Apr.-May. Var. COLUMBÌNUM Jepson n. comb. Heads dove-color, longer than broad, 6 to 12 lines high; pods pubescent, 1-seeded. — Low hills, North Coast Ranges from Solano Co. to Mendocino and Colusa Cos. Var. GRÍSEUM Jepson n. var. Heads gray, broadly ovate, 6 to 8 lines high; flowers less completely concealed. — Hills bordering the w. side of the San Joaquin Valley (New Idria, Jepson 2708, type).

537. Trifolium eriocephalum Nutt.; *a*, fl. branchlet x ½; *b*, fl. x 2.

39. **T. praténse** L. RED CLOVER. Stems branching from the base, ½ to 2 ft. high; herbage pubescent; petioles short, the leaves subtending, the head sessile; leaflets large, ovate to elliptic, entire to crenulate, often with a whitish blotch near the middle, 1 to 1¾ in. long; stipules membranous, conspicuously veined; heads round-ovate to conical, ¾ to 1 in. high; corolla deep pink or red; calyx-tube characteristically nerved near the base of teeth; pod 2-seeded. —Nat. from Eur.; low moist valleys or meadows in the mts.

40. **T. ériocéphalum** Nutt. Fig. 537. Stems erect or at base decumbent, ½ to 1 ft. high; herbage vil-

lous with spreading hairs, or rarely glabrous; stipules long, nearly entire; leaflets narrowly oblong or sometimes broader, serrulate, ½ to 1½ in. long; peduncles becoming recurved; heads dense, globose, slightly spicate, ½ to ¾ in. broad; flowers early reflexed, 4 to 6 lines long; calyx-teeth plumose, filiform, lax, ⅔ the length of the petals; corolla dull yellow; ovary hairy, 2 to 4-ovuled.—Humboldt Co. to Siskiyou Co.; n. to Wash. and Ida. June. Var. HARNEYÉNSE McDer. Leaves long and narrow (¾ to 2½ in. long, 1 to 2½ lines broad); heads 5 to 6 lines broad.—Siskiyou Co.; n. to Ida.

41. **T. lóngipes** Nutt. Stems slender, erect or ascending, 2 to 12 in. high, arising from a branched woody rootstock; stems usually glabrous, the leaflets and calyx sparingly villous; stipules ovate-lanceolate, entire or toothed; leaflets narrowly oblong or obovate to oblanceolate, serrulate, ⅛ to 1½ in. long; peduncles (1 or) 2½ to 4½ in. long, remaining erect; heads broadly ovate, rather dense, 7 to 10 lines high; corolla 5 to 6 lines long, yellowish-white or tinged with purple; calyx-teeth lanceolate-subulate, straight, more or less hairy, shorter than the corolla; ovules 2 to 4.—Montane, 6000 to 8500 ft.: San Jacinto and San Bernardino mountains; Sierra Nevada from Tulare Co. to Shasta and Modoc Cos.; Mt. Sanhedrin to Yollo Bolly Mts.; e. to Rocky Mts., n. to Canada. June-July. Var. ÉLMERI McDer. Stouter, 1½ to 2 ft. high; leaflets linear-oblong, 1½ to 2¾ in. long.—E. Humboldt Co. July-Aug.

17. LÒTUS L. Bird's-foot Trefoil

By Alice M. Ottley

Herbs or suffrutescent plants. Leaves alternate, pinnately compound, with 3 to many leaflets; stipules foliaceous, membranous, scarious, or gland-like. Flowers solitary or umbellate, mostly leafy-bracteate. Calyx-teeth subequal. Corolla yellow to nearly white, often marked with rose, red or purple; petals of keel with more or less prominent lobe at base of blade, which is closely associated with pocket on wings. Stamens diadelphous. Legumes straight to strongly arcuate, one to many-seeded. (Ancient Greek plant-name.)

Corolla white or cream-colored, veined or suffused with rose or red.
- Stipules broadly ovate to lanceolate; flowers umbellate, 1 to 1.2 cm. long; perennials.. 3. *L. stipularis.*
- Stipules gland-like; flowers solitary, 4 to 9 mm. long; annuals.
  - Calyx-teeth longer than the tube....18. *L. americanus.*
  - Calyx-teeth not longer than the tube.
    - Flowers peduncled; bract 3 (1 or 2)-foliolate....14. *L. micranthus.*
    - Flowers nearly sessile, ebracteate....17. *L. denticulatus.*

Corolla greenish yellow to yellow, variously marked with rose, red or purple.
- Stipules foliaceous, membranous or scarious; perennials.
  - Bract usually distant from the umbel and of several leaflets, stipulate; pedicels 1 to 10 mm. long.
    - Herbage gray-woolly, somewhat silky....2. *L. incanus*
    - Herbage bright-green to glaucous, glabrate, the young tips pubescent.... 1. *L. crassifolius.*
  - Bract when present borne at the base of the umbel and of 1 to 3 leaflets; pedicels rarely more than 1 mm. long.
    - Stems arising from a thickened root; claws of the petals distinctly exserted beyond the calyx-tube.
      - Bract mostly absent; corolla yellow and white or cream-colored.... 5. *L. pinnatus.*
      - Bract present; banner yellow, wings pale rose or lilac, tip of keel purple....4. *L. formosissimus.*
    - Stems arising from a slender rhizome; banner yellow, more or less veined with purple, wings whitish; claws of petals obscurely exserted beyond the calyx-tube....6. *L. oblongifolius.*
- Stipules gland-like.
  - Annuals.
    - Flowers in pedunculate umbels.
      - Legumes straight-beaked; seeds granulose, sometimes rugose; umbels 1 to 3-flowered.
        - Seeds quadrate, notched at the hilum....11. *L. strigosus.*
        - Seeds subglobose....12. *L. tomentellus.*
      - Legumes not straight-beaked; seeds smooth.
        - Beak of legume recurved, short; umbels 1 to 5-flowered.... 13. *L. salsuginosus.*
        - Beak of legume involute, long; umbels several-flowered.
          - Style glabrous....28. *L. nuttallianus.*
          - Style pubescent....29. *L. hamatus.*
    - Flowers solitary, sessile or short-pediceled.
      - Calyx-teeth equaling or shorter than the tube....16. *L. subpinnatus.*

Calyx-teeth mostly twice as long as the tube.....15. *L. humistratus.*
Perennials.
Flowers 1.3 to 2.5 cm. long; umbels long-peduncled.
Leaflets 7 to 9.....7. *L. grandiflorus.*
Leaflets 3 to 5.....8. *L. rigidus.*
Flowers 1.2 cm. or less long.
Legumes straight or nearly so.
Umbels long-peduncled; fruits dehiscent.
Legumes mostly reddish brown, appressed-pubescent; var. multicaulis of.....9. *L. wrightii.*
Legumes mostly straw-colored, thinly silky-pubescent.....10. *L. argyraeus.*
Umbels sessile to short-peduncled; fruit indehiscent.
Herbage silky-canescent.....23. *L. leucophyllus.*
Herbage glabrous to glabrate, growing tips often pubescent.
Calyx-teeth subulate, lax, often recurved..26. *L. benthamii.*
Calyx-teeth subulate, stiff, always erect..24. *L. scoparius.*
Legumes slightly curved to strongly arcuate.
Calyx-teeth short-triangular with midvein broad and conspicuous..27. *L. junceus.*
Calyx-teeth linear to filiform, often subulate.
Herbage nearly glabrous.....25. *L. haydonii.*
Herbage pubescent.
Pubescence somewhat woolly, hairs of young stems loose and spreading, making with the stem, at point of insertion, a right or an obtuse angle.....19. *L. eriophorus.*
Pubescence mostly appressed, hairs of young stems, making with the stem, at point of insertion, an acute angle.
Banner blade oblong to short-oblong, making an acute angle with the wings.
Pubescence usually silky, hairs on leaves and calyces soft, straight, mostly long...21. *L. argophyllus.*
Pubescence not silky, hairs on leaves and calyces somewhat arched.....20. *L. douglasii.*
Banner blade short-obovate, either reflexed or erect and making a right angle with the wings..22. *L. davidsonii.*

I. Subgenus HOSACKIA.—Stipules foliaceous, membranous or scarious; umbels few to many-flowered, long-peduncled; flowers 7 to 20 mm. long; legumes straight, abruptly short-beaked, dehiscent, not reflexed; perennials.

A. LEGUMES LINEAR OBLONG; FLOWERS 1 TO 1.5 CM. LONG; CLAWS OF PETALS EXSERTED BEYOND THE CALYX-TUBE; LEAFLETS 5 TO 15.

538. Lotus crassifolius Greene; *a*, fl. branchlet x 1; *b*, pod x ½.

1. **L. crassifòlius** (Benth.) Greene. Fig. 538. Stems erect, fistulose, 4 to 12 dm. high, with long internodes; leaflets oval, rhombic or obovate; umbels one-sided; flowers greenish yellow marked with dark red; calyx-teeth usually very short and subulate-triangular; legumes 3.5 to 7 cm. long, 3 mm. or more wide, several to many-seeded.—Foothills and mountains, 2300 to 8000 ft.: San Jacinto Mts. of S. Cal.; Sierra Nevada; Coast Ranges; n. to the Columbia River. May-July. (Hosackia crassifolia Benth. H. stolonifera Lindl.)

2. **L. incànus** (Torr.) Greene. Fig. 539. Stems erect, 1.5 to 3 dm. high; leaflets oval to elliptical; calyx-teeth linear-subulate, less than half the length of the tube; legumes 1.5 to 4 cm. long, 2 to 7 mm. wide, glabrous.—Open places in pine woods: Butte, Placer and Nevada Cos., 2500 to 3400 ft. May-July. (Hosackia incana Torr.)

3. **L. stipulàris** (Benth.) Greene. Stems erect, 3 to 5 dm. high, woody; herbage

539. Lotus incanus Greene; *a*, fr. branchlet x 1; *b*, fl. x 2.

loosely villous; hairs long and somewhat wavy, often viscid-glandular; leaflets oval to nearly oblong, the first pair often at the base of the leaf, covering the stipules; pedicels 2 to 4 mm. long; calyx long-campanulate, teeth short-triangular or subulate, 1 (or 2) mm. or less long; wings of corolla spreading; legumes 3 cm. or less long, 2 to 3 mm. wide, often glandular.—Dry hillsides and mountain slopes, 10 to 3800 ft.: Coast Ranges from Monterey Co. to Mendocino Co.; Sierra Nevada from Shasta Co. to Tulare Co.; infrequent. Apr.-July. (Hosackia stipularis Benth. H. macrophylla Kell. H. balsamifera Kell.) Var. SUBGLÀBER Ottley. Prostrate to erect; herbage nearly glabrous, underside of leaflets glaucous; pedicels 1 to 2 mm. long; calyx-tube turbinate-campanulate, teeth triangular, ciliolate; legumes 1.5 to 4 cm. long, 3 to 4.5 mm. wide.—Border of woods of the plains, hills or mountains; Sonoma, Mendocino, Humboldt, and Del Norte Cos.; n. to Wash. Not abundant. Apr.-July. (Hosackia rosea Eastw.)

B. LEGUMES LINEAR.

4. **L. formosíssimus** Greene. WITCH'S TEETH. Fig. 540. Stems herbaceous, weak; herbage glabrous; basal leaves with 3 to 5 obovate retuse leaflets, upper leaves with 5 or 7 (or 9) oblanceolate to elliptical acute leaflets; bract of 1 to 3 (or to 7) leaflets; flowers 1.3 to 2 cm. long; calyx slightly 2-lipped; banner blade oblong, reflexed; wings of corolla spreading; claws of the keel longer than the acutely beaked blades. — Damp or springy ground, 10 to 1500 ft., mostly along the coast from Monterey and San Benito Cos. to Del Norte Co.; n. to Wash. Mar.-June. (Hosackia gracilis Benth.)

5. **L. pinnàtus** Hook. Stems flexuous, 2 to 4 dm. high; herbage glabrous; leaflets 5 to 9, oval or obovate, obtuse or acute, somewhat mucronulate; umbels not leafy-bracteate as a rule, but with an involucre of short, scarious bractlets; flowers 1.2 to 1.5 cm. long; calyx 2-lipped, with tube transparent and lighter than the dark conic hypanthium; claws of the keel petals and blade of the banner as in no. 4.—Occasional in moist ground, 3000 to 6000 ft.: Trinity and Shasta Cos.; Sierra Nevada from Calaveras Co. to Plumas Co.; n. to Wash., where more abundant. Apr.-July. (Hosackia bicolor Dougl.)

6. **L. oblongifòlius** (Benth.) Greene. Stems erect, 1.5 to 3 dm. high, bright green; herbage pubescent with short-appressed hairs; leaves 7 to 11-foliolate; leaflets linear-lanceolate or ellip-

540. Lotus formosissimus Greene; *a*, fl. branchlet x ½; *b*, fl. x 1½; *c*, pods x ½.

tical, acute at both ends; umbels 1 to 5-flowered; flowers 8 to 15 mm. long; calyx-tube turbinate-campanulate, somewhat villous; banner blade ovate, erect, claws of the keel shorter than the broad, rounded blade.—Along streams in the foothills and mts. of S. Cal., 1000 to 6000 ft., from San Diego Co. to Santa Barbara Co. and the Tehachapi Mts. Frequent. May-Oct. (Hosackia oblongifolia Benth. H. lathyroides D. & H.) Var. TÓRREYI (Gray) Ottley. Hirsute-pubescent, becoming glabrate; leaflets oblanceolate or obovate, mostly obtuse, those of the uppermost leaves often elliptical or oval and acute at both ends; flowers 10 to 15 mm. long.—Meadows and along streams: Sierra Nevada; North Coast Ranges; frequent. May-Sept. (L. torreyi Greene. Hosackia torreyi Gray.) Var. CUPREUS (Greene) Ottley. Stems low, much-branched and flaccid, arising from a closely branched woody rhizome, glabrous; leaflets oblanceolate, mucronate, those of the lower leaves mostly cuneate-obovate; umbels 1 to 3-flowered; flowers 7 to 8 mm. long.—Meadows: s. Sierra Nevada, 8000 ft. or higher. Local. June-Aug. (L. cupreus Greene. Hosackia cuprea Smiley.)

II. Subgenus ANISOLOTUS.—Stipules gland-like; flowers solitary or umbellate, 4 to 25 mm. long; legumes straight or nearly so, abruptly short-beaked, dehiscent, not reflexed.

A. WINGS TURNED OBLIQUELY IN RELATION TO THE SHORT KEEL; BANNER BLADE OBLONG, ATTENUATE INTO THE CLAW, ROLLING BACK.

1. Perennials.

a. Stems erect from a branched woody rhizome; legumes linear, many-seeded.

7. **L. grandiflòrus** (Benth.) Greene. Fig. 541. Stems 4 to 7 dm. high; young stems and leaves slightly puberulent; leaves 3 to 9 cm. long; leaflets obovate, obtuse, mucronate; umbels several-flowered; bract of 1 to 3 large leaflets; calyx with soft, short, white hairs between its teeth, teeth long-subulate with a broad base to nearly linear, half to nearly as long as the tube; corolla lemon-yellow, turning deep rose with age.—Dry slopes, 2000 to 3500 ft.: Sierra Nevada from Mariposa Co. to Shasta Co., thence s. in the Coast Ranges to Santa Barbara Co. and mts. of S. Cal. Mar.-July. Infrequent. (Hosackia grandiflora Benth. The form of the Sierra Nevada is larger than that of the Coast Ranges and represents Hosackia macrantha Greene.) Var. MUTÁBILIS Ottley. Shorter; herbage velvety-pubescent; leaves mostly less than 4 cm. long; peduncles shorter or slightly longer than the leaves; flowers 1.5 to 1.8 cm. long.—Ridges: Coast Ranges from Mendocino and Lake Cos. to San Luis Obispo Co.; s. to mts. of S. Cal.; Calaveras Co., Sierra Nevada. More frequent than the species. Apr.-June. (Hosackia grandiflora var. anthylloides Gray. L. leucophaeus Greene. L. confinis Greene.)

541. Lotus grandiflorus Greene; *a*, fl. branchlet x ½; *b*, pod x ¼.

8. **L. rígidus** (Benth.) Greene. Suffrutescent with stems coarse and rigid; internodes long; herbage pubescent with scanty, short, appressed white hairs, becoming glabrate; leaves short (1 to 2 cm. long); leaf-rachis clearly evident when bearing 5 leaflets; leaflets linear-oblong, obtuse or truncate at apex, cuneate at base, markedly variable in length; umbels 2 or 3-flowered; bracts when present commonly of 1 small leaflet; calyx-teeth broadly subulate, ½ to ¼ the length of the tube (rarely almost equaling it in length); legumes straw-color, shining, terete; seeds globose, granulose.—Ranges in

and bordering the deserts: Inyo Co.; e. Mohave Desert; Colorado Desert (where it reaches its best development); e. to Utah and Ariz., s. to L. Cal. Mar.-June. (Hosackia rigida Benth. L. argensis Cov.)

b. Stems many from the root-crown; leaves short; umbels bractless.

9. **L. wrightii** (Gray) Greene var. **multicáulis** Ottley. Decumbent or ascending, stems 2.5 dm. or less long, slender; herbage appressed-pubescent; leaflets mostly 3 or 4, oblong or oblanceolate; peduncles 2 to 4 cm. long; umbels commonly 2-flowered; flowers 1 cm. long; calyx ½ as long, teeth narrowly lanceolate to linear, ½ as long as the tube; legumes linear, 2 to 3 cm. long, 2 to 3 mm. wide; seeds subglobose.—New York Mts., e. Mohave Desert; e. to Nev. Apr.-May.

10. **L. argyraèus** Greene. Stems prostrate with short internodes; herbage, calyces and legumes covered with a white, silky, appressed pubescence; leaves often broader than long, petiole and rachis short; leaflets 3 to 5, cuneate-oblanceolate or cuneate-obovate, mostly obtuse to truncate; umbels 1 or 2 (or 3)-flowered; flowers 8 to 10 mm. long; calyx-teeth subulate, slightly more than one-half as long as the tube; legumes linear to linear-oblong, 1 to 2.2 cm. long; seeds oblong-spherical, smooth.—Mountain valleys: San Bernardino Mts. to San Diego Co.; s. to L. Cal. Occasional. May-Sept. (Hosackia argyraea Greene.)

2. Annuals; stems several from the root-crown.

11. **L. strigòsus** (Nutt.) Greene. Stems slender, decumbent to ascending; herbage and legumes thinly appressed-hirsutulous; leaves 1.5 to 2.5 cm. long; leaflets linear-oblong, acute, scattered along the flattened rachis, the basal one nearly at juncture of petiole with stem, about half the length of the terminal one; flowers 5 to 10 mm. long; legumes straight or slightly curved at apex, 2 to 3 cm. long, 2 to 2.5 mm. wide; seeds not more than 1 mm. in diameter.—Sandy soil along the coast from San Francisco to San Diego Co. Jan.-Nov. (Hosackia strigosa Nutt. H. rubella Nutt. H. nudiflora Nutt.) Var. HIRTÉLLUS (Greene) Ottley. Canescently hirsutulous, hairs not appressed; leaves 1 to 2 cm. long; leaflets cuneate-oblanceolate, obovate or oblong, obtuse, thickish; flowers 8 to 11 mm. long; legumes mostly 3 mm. wide, usually somewhat constricted between the seeds; seeds larger than for the species.—Arid situations, mainly in the pine belt on ridges, Tuolumne Co. to S. Cal.; s. to L. Cal. Apr.-Oct. Intergrades with the type represent Nuttall's Hosackia nudiflora. (L. hirtellus Greene.)

542. Lotus tomentellus Greene; fl. and fr. branchlet x 1.

12. **L. tomentéllus** Greene. Fig. 542. Small prostrate plant with leaves and flowers resembling those of L. strigosus var. hirtellus; pubescence thin, canescently hirsutulous; legumes less than 3 mm. wide.—Deserts: Panamint Mts. to Colorado Desert; e. to Ariz., s. to L. Cal. Mar.-May.

B. WINGS PARALLEL TO THE KEEL; BANNER BLADE ABRUPTLY CLAWED.

1. Lobe or process of keel shallow; legumes linear; seeds globose to short-oblong.

13. **L. salsùginòsus** Greene. Decumbent or procumbent; stems many from the crown of the root; pubescence of few, short, appressed hairs; leaves slightly succulent, 2 to 4 cm. long, the rachis flattened; leaflets mostly 5 or 6, obovate to orbicular; umbel with a bract of 1 to 3 ovate or orbicular leaflets; flowers 8 to 10 mm. long; keel obtuse.—Coastal counties from Santa Clara to San Diego; Reché Cañon, San Bernardino Co.; Santa Barbara Isls.; s. to L. Cal. Mar.-July. (Hosackia maritima Nutt.) Var. BRÉVIVEXÍLLUS Ottley. Small and prostrate; peduncles shorter than the leaves; flowers 3 to 5 mm. long; banner and wings shorter than the keel; legumes 1 to 2 cm. long, con-

stricted between the seeds. — Panamint Mts.; Colorado Desert; San Diego Co.; Ariz. to Mex. and L. Cal.; islands w. of L. Cal. Mar.-May. (L. humilis Greene.)

14. **L. micránthus** Benth. Fig. 543. Low, diffusely branched; stems slender and wiry; rachis of leaf terete; leaflets 3 to 5, somewhat glaucous, oblong, oblanceolate or elliptical, obtuse; flowers 4 to 5 mm. long; calyx turbinate-campanulate; banner blade short-oblong to nearly orbicular; keel acute; legumes constricted between the seeds; seeds 5 to 9, suborbicular to short-oblong. — Fairly common in grassy situations in the foothills, 100 to 4000 ft.: Coast Ranges; Sierra Nevada; s. to Los Angeles Co.; n. to Wash. Jan.-Aug. (Hosackia parviflora Benth.)

543. Lotus micranthus Benth.; *a*, habit x ½; *b*, fl. x 4.

2. Lobe or process of keel deep; keel attenuately beaked, its upper margin covered, except at the tip, by the wings; legumes linear to oblong; seeds umbilicate; rachis of leaf flattened; leaflets 3 to 5; flowers 5 to 8 mm. long.

15. **L. humistràtus** Greene. HILL LOTUS. Stems prostrate to ascending, diffusely branched; herbage densely villous or sometimes only slightly so; leaflets oblanceolate to obovate, 2 or 3 at apex of the rachis, the others scattered; banner short-clawed, blade nearly orbicular; legumes oblong, commonly straw-color, 7 to 10 mm. long; seeds 2 to 5, mostly 3.—Largely confined to dry hillsides 100 to 2500 ft.: Siskiyou Co.; Coast Ranges; Sierra Nevada foothills; Inyo Co.; Mohave Desert; thence e. to N. Mex. Apr.-July. (Hosackia brachycarpa Benth. Lotus trispermus Greene.)

544. Lotus subpinnatus Lag.; *a*, habit x ½; *b*, fl. x 1; *c*, fl. x 1.

16. **L. subpinnàtus** Lag. Fig. 544. Closely allied to no. 15, pubescence less marked, varying from pilose to nearly glabrous; legumes oblong to linear, 10 to 25 mm. long, 3 to 7-seeded.—Hillsides and plains 20 to 2500 ft., throughout cismontane Cal., often growing with L. humistratus. Mar.-Oct. (Hosackia subpinnata T. & G. H. wrangeliana T. & G.)

17. **L. dénticulàtus** (Drew) Greene. Stems erect, 2 to 5 dm. high; branches few and coarse; stems glabrous or with scanty, appressed pubescence, sometimes glaucous; leaves and calyces pilose, often denticulate; legumes 1 to 2 cm. long, 3 to 4 mm. wide.—Butte Co. to Siskiyou Co., thence s. to Mendocino Co.; n. to B. C. May-Aug. (Hosackia denticulata Drew.)

III. Subgenus ACMISPON.—Stipules gland-like; leaves with 3 leaflets, terminal leaflet petiolulate, oblong or elliptical, acute, the 2 lateral ones asymmetrically ovate, nearly sessile, borne near or at the base of

the leaf; flowers solitary, peduncled, bracteate; keel acutely beaked; legumes linear, abruptly short-beaked, dehiscent, not reflexed; annuals.

18. **L. americànus** (Nutt.) Bisch. SPANISH CLOVER. Stems erect or ascending, 1.5 to 4.5 dm. high, well-branched; herbage silky-villous or pilose to nearly glabrous; vigorous branches sometimes bearing leaves with 4 or 5 leaflets and tips of branches occasionally with leaves of but 1 leaflet; peduncles exceeding the leaves or shorter; calyx-teeth subulate-lanceolate; legumes 3 to 7-seeded.—Throughout Cal. but mostly in the cismontane region; ne. to Minn., se. to Tex. and Mex. May-Oct. (L. sericeus Pursh. Hosackia purshiana Benth.) Var. MINUTIFLÒRUS Ottley. Decumbent, less robust than the type, pilose to nearly glabrous; peduncles longer or shorter than the leaves; flowers 4 to 5 mm. long.—Apparently a reduced form of the species growing at high altitudes or under other unfavorable conditions. June-July. (Hosackia elata var. glabra Nutt. H. pilosa Nutt.)

IV. Subgenus SYRMATIUM.—Stipules gland-like; flowers yellow, often marked with red, 3 to 12 mm. long, umbellate (umbels sometimes reduced to a single flower); legumes less than 2 cm. long, straight to arcuate, mostly attenuate into a long, incurved beak, indehiscent, reflexed; fruit deciduous at base of pedicel.

A. PERENNIALS.

1. Herbage conspicuously pubescent; many branches arising from the root-crown.

a. Umbels several to many-flowered, short-peduncled to sessile, bracteate; prostrate to decumbent (L. argophyllus var. ornithopus erect).

19. **L. erióphorus** Greene. Plants forming dense mats several dm. in diameter, covered with a gray or rusty-villous pubescence; leaves on the main branches often conspicuously larger than those on the secondary branches; leaflets 4 to 6, scattered, oblanceolate or obovate, acute and apiculate; flowers 5 to 7 mm. long; calyx slightly more than one-half the length of the flower, its teeth approaching the length of the tube; legumes terete, arcuate, not keeled or only slightly so, abruptly beaked, usually 2-seeded.—Near the coast from Sonoma Co. to San Diego. Apr.-Oct. (Hosackia tomentosa H. & A.) Var. HEERMÁNNII (D. & H.) Ottley. Pubescence thinner, stems often glabrate; flowers smaller, 3 to 5 mm. long; legumes mostly 1-seeded.—Santa Cruz Co. to San Diego Co.; San Bernardino and Riverside Cos. The typical condition of the variety appears in sandy washes at low altitudes. In the San Jacinto Mts. it closely resembles L. douglasii var. nevadensis but may be distinguished from it by the character of the pubescence. (Hosackia heermannii D. & H.)

20. **L. douglásii** Greene. Pubescence of stems of short, appressed hairs, of leaves and calyces somewhat villous; stems with long internodes; leaflets 4 or 5, oblanceolate or obovate, mostly acute; flowers 10 to 12 mm. long; calyx-teeth equal in length to the tube; wings oblong, noticeably surpassing the keel; legumes canescent, arcuate, attenuately beaked, mostly clearly keeled, extending well beyond the calyx-teeth.—Hills and mountains, Sierra Co. to Siskiyou Co.; n. to Wash. and Ida. Reaches its typical condition north of the state. May-July. (Hosackia decumbens Benth.) Var. NEVADÉNSIS (Wats.) Ottley. Often flowering the first season; pubescence always appressed; branches wiry; flowers 4 to 7 mm. long; calyx-teeth not more than half the length of the tube; wings equaling or exceeding the keel in length.—Mountains, 3500 to 6500 ft.: Sierra Nevada, n. to Siskiyou Co. s. to mts. of S. Cal.; e. to Nev. (Hosackia decumbens var. nevadensis Wats.) Var. CONGÉSTUS Ottley. Villous character of the pubescence more marked; branches shorter than for the type, 15 to 25 cm. long; internodes short; umbels dense, confined to the tips of the branches; leaflets elliptical, acute at both ends.—Hill country of Lake, Humboldt, Trinity and Siskiyou Cos. May-July. (L. incanus Dougl.)

21. **L. argophýllus** (Gray) Greene. Silvery-tomentose, tomentum close, extending from apex to base of the long, slender, decumbent branches, longer, denser and more silky on the leaves and calyces; leaves 8 to 15 mm. long; leaflets 3 to 5, roundish obovate; umbels nearly sessile, dense, extending back from the apex of the stem for some distance; bract of 1 leaflet, commonly present; flowers 8 to 10 mm. long; pedicels short, hidden by the pubescence; calyx-teeth obscured by the pubescence, about half the length of the tube; ovary with 2 to 4 ovules; legumes silky, slightly longer than the calyx, nearly straight, attenuately beaked, mostly clearly keeled, 1 (or 2)-seeded; seeds curved-oblong.—Foothills and plains, Monterey and Fresno Cos. to S. Cal. Mar.-July. (Hosackia argophylla Gray.) Var. FREMÓNTII (Gray) Ottley. Leaves slightly longer than those of the type; leaflets broadly oblanceolate or obovate to elliptical, acute; umbels confined to the ends of the branches; calyx-teeth as long as the tube; blade of banner shorter than its claw.—Sierra Nevada from Placer Co. to Mariposa Co. Occasional. May-July. (Hosackia argophylla var. fremontii Gray.) Var. DECÒRUS (Jtn.) Ottley. Herbage glistening satiny-canescent throughout or only at tips of the branches; umbels peduncled; pedicels more evident than in the type.—Foothills and mts. of S. Cal. Apr.-July. (Hosackia argophylla var. decora Jtn.) Var. NÌVEUS (Greene) Ottley. Stems woody and stocky, characterized by short internodes; leaflets acute; calyx-teeth as long as the tube, extending beyond the corolla.—Santa Cruz and San Clemente Isls. (Syrmatium niveum Greene.) Var. ORNÍTHOPUS (Greene) Ottley. Less pubescent than the species or the varieties, herbage somewhat silky, stems becoming glabrate; leaflets 3 to 7, mostly 4 or 5, 6 to 12 mm. long, acute; umbels long-peduncled; legumes conspicuously exceeding the calyx, 2-seeded.—Santa Barbara Isls. Apr.-June. (Hosackia ornithopus Greene. H. venusta Eastw.)

22. **L. davidsònii** Greene. Closely resembling L. douglasii var. nevadensis and L. argophyllus var. decorus in habit and general appearance; herbage bluish-green or silvery; flowers 5 to 8 mm. long; calyx-teeth half as long as the tube or approaching it in length.—Pine belt of the mts. of S. Cal.; frequent. May-Aug. (L. sulphureus Greene.)

545. Lotus scoparius Ottley; *a*, fl. branchlet x ½; *b*, fl. x 2; c, pod x 2.

b. Umbels 1 to 3 (or 5)-flowered, sessile, bractless; prostrate to erect.

23. **L. leucophýllus** Greene. Suffrutescent to slightly woody at base; leaflets 3, approximate, elliptical (or oblanceolate), acute; flowers 6 to 9 mm. long; calyx nearly half as long, teeth narrowly linear, about half as long as the tube; claws of the petals exserted; legumes silky-canescent, slender, much exceeding the calyx; seeds 2 to several.—Foothills and mountains, 1000 to 6000 ft.: San Benito and Monterey Cos. to Inyo Co.; s. to Cajon Pass and San Gorgonio Pass. Apr.-July. (Hosackia sericea Benth. H. procumbens Greene.) Var. JEPSÒNII Ottley. Flowers 1 to 2 in an umbel, 9 to 12 mm. long; calyx-teeth between 2 and 3 mm. long and more than half the length of the tube; claws of the petals scarcely exserted.—S. Sierra Nevada in Tulare and Kern Cos., 6000 to 6300 ft. July.

2. Herbage not conspicuously pubescent, growing tips often appressed-pubescent; suffrutescent (L. junceus var. biolettii somewhat herbaceous).

24. **L. scopàrius** (Nutt.) Ottley. DEERWEED. Fig. 545. Suberect, bushy, 4 to 12 dm. high, with long virgate greenish

branches; stipular ridge prominent; leaflets 3 (4 or 5), oblong or oblanceolate (or oval), acute; umbels sessile or nearly so, extending back from apex of branches for many cm.; flowers 8 to 10 mm. long; legumes much surpassing the calyx, 1 or 2-seeded.—Hill country, 10 to 2500 ft.: Sierra Nevada foothills from Amador Co. to Kern Co.; Coast Ranges from Humboldt Co. to San Luis Obispo Co.; s. to coastal S. Cal.; abundant. Feb.-Oct. Plants having calyx-teeth triangular, with a prominent midvein ending in a subulate point, occur in San Diego Co. (Hosackia scoparia Nutt. L. glaber Greene. Syrmatium glabrum Vog.) Var. VEATCHII (Greene) Ottley. Decumbent, more pubescent than the type; leaflets oblanceolate, obtuse; umbels nearly sessile; flowers 10 to 12 mm. long; calyx-teeth subulate-triangular; legumes 2-seeded. —San Miguel Isl.; s. to L. Cal. (Hosackia veatchii Greene. Syrmatium patens Greene.) Var. DENDROÍDEUS (Greene) Ottley. Erect, more woody than the species, 12 to 21 dm. high; umbels short-peduncled; flowers 10 to 12 mm. long; legumes 2 or 3-seeded, longer than in the species.—Santa Cruz, Santa Rosa and Santa Catalina Isls. Jan.-Aug. (Syrmatium dendroideum Greene.) Var. TRÁSKIAE (Eastw.) Ottley. Erect; leaflets oblanceolate, obtuse; umbels pedunculate, with or without a 1-foliolate bract; calyx-teeth short, subulate-triangular; claws conspicuously exserted. — Santa Catalina Isl. (Syrmatium traskiae Eastw.) Var. BREVIALÀTUS Ottley. Flowers 8 to 10 mm. long; banner short, keel extending noticeably beyond the upward curving wings.—S. Cal.; less abundant than the species.

25. **L. haydònii** (Orcutt) Greene. Low, erect, thickly branched, with inconspicuous leaves and flowers, the plant appearing little more than a mass of slender stiff greenish branches; leaves ternate; leaflets elliptical, obtuse, 2.5 mm. or less long; flowers solitary or rarely in pairs, short-pedunculate, 5 mm. or less long; legumes incurved, 1-seeded.—Stony slopes, w. border of the Colorado Desert; s. to L. Cal.; local. Apr. (Hosackia haydoni Orcutt. L. spencerae Mcbr.)

26. **L. benthámii** Greene. Stems brownish, abundantly branched, occasionally forming masses 7.5 dm. high and 12 dm. in diameter; stipules prominent; leaflets 3 to 5, oblong or cuneate-oblanceolate; peduncles exceeding the leaves; bract of 1 or 2 leaflets, sometimes lacking; legumes falcate, the subulate beak nearly as long as the body, 2-seeded.—Coastal: Sonoma Co.; San Mateo Co. to Santa Barbara Co. Apr.-Oct. (Hosackia cytisoides Benth.)

27. **L. júnceus** (Benth.) Greene. Stems brownish, low, erect to decumbent, much-branched, often two or three branches from a node; leaflets 3 to 5, rounded-oblanceolate; peduncles shorter or longer than the leaves; umbels mostly ebracteate; legumes short, terete and arcuate, 1-seeded.—Infrequent on dry hills and ridges, Mt. Tamalpais to San Luis Obispo. Apr.-July. (Hosackia juncea Benth.) Var. BIOLÉTTII (Greene) Ottley. Prostrate to decumbent, with many branches arising from the crown of the root; stems more delicate and wiry than for the species; pubescence more abundant, of short appressed hairs; leaflets oblanceolate or obovate, obtuse or acute; peduncles 5 to 20 mm. long; bract of 1 leaflet.—Dry ridges and burned-over areas: Fort Bragg; Mt. Tamalpais. May-Oct. (L. biolettii Greene.)

B. ANNUALS; PROSTRATE WITH MANY BRANCHES ARISING FROM THE CROWN OF THE ROOT.

28. **L. núttallìanus** Greene. Branches long and slender; young stems, leaves and calyces thinly hirsutulous, older stems glabrate; leaves 5 to 7-foliolate; leaflets cuneate-oblanceolate, acute or obtuse; peduncles exceeding the leaves; bract when present mostly of 1 leaflet; flowers 5 to 7 mm. long, the calyx less than half as long; calyx-teeth triangular, about ⅓ as long as the tube; legumes several times as long as the calyx, slender, arcuate, constricted between the two seeds.—Coastal: San Diego Co. to L. Cal.; local. Apr.-June. (Hosackia prostrata Nutt.)

29. **L. hamàtus** Greene. Fig. 546. Young stems, leaves and calyces appressed-pubescent; leaflets 4 to 6, oblanceolate, often mucronate and cuneate; umbels sessile or nearly so, ebracteate; flowers 3 to 4.5 mm. long, the calyx half as long; shape of fruit as in the preceding species; pericarp with wavy

546. Lotus hamatus Greene; *a*, fl. branchlet x 1; *b*, pod x 2.

v-shaped markings.—Occasional in sandy soils: Los Angeles, San Diego, San Bernardino, and Riverside Cos.; Santa Catalina Isl.; L. Cal. Mar.-June. (Hosackia micrantha Nutt. in part.)

18. **AMÓRPHA** L.

Deciduous shrubs with heavy-scented herbage. Leaves odd-pinnate, with caducous stipules and stipels, the leaflets dotted with translucent glands. Flowers small, violet or purple, in long and narrow terminal spikes. Calyx obconic, 5-toothed, persistent. Petals wanting except the banner, this erect, clawed, folded around the stamens and style. Stamens monadelphous at the very base, otherwise distinct, longer than the banner. Pod short, but exceeding the calyx, 1 or 2-seeded, tardily dehiscent. (Greek amorphos, deformed, alluding to the corolla.)

Branchlets and leaves without prickle-like glands; calyx-teeth very short, low-triangular.....1. *A. fruticosa.*
Branchlets and leaf-rachis with prickle-like glands; calyx-teeth acute-triangular or lanceolate, ½ to ¾ as long as the tube.....2. *A. californica.*

1. **A. fruticòsa** L. False Indigo. Shrub 3 to 6 ft. high; herbage minutely pubescent; leaflets 11 to 15, ovate to oblong, ¾ to 1⅜ in. long, shortly petioled; stipules and bracts (as also in no. 2) linear-lanceolate, caducous; racemes 3 to 9 in. long; flowers 3 lines long; calyx canescent, especially on the teeth, with many glands; banner dark purple, truncatish or notched; pod with conspicuous blister-like glands, 4 lines long.—Along streams in the foothills and mts.: s. slope San Gabriel and San Bernardino mountains to San Diego Co., w. side Colorado Desert; e. to Mississippi Valley and Fla. (A. occidentalis Abrams.)

2. **A. califórnica** Nutt. Mock Locust. Fig. 547. Shrub 4 to 7 ft. high; herbage minutely pubescent; leaflets 11 to 27, oblong-elliptical, mucronulate at the retuse apex, shortly petioled, 7 to 12 lines long; rachis with prickle-like glands scattered among the sessile ones, the prickles often more or less deciduous late in the season; racemes 2 to 5½ in. long; flowers as in no. 1 except that the calyx has longer teeth; pod 2½ lines long, with many low circular glands which are depressed or somewhat excavated in the center. —Wooded cañons, 500 to 3000 ft.; Marin Co. to San Luis Obispo and Mt. Pinos; s. to the San Bernardino and Santa Ana mountains. (A. hispidula Greene.) Var. napénsis Jepson n. var. Subglabrous; glands on the rachis none; racemes 1 to 1¼ in. long; calyx nearly glabrous and glandless, its teeth minute.—Howell Mt., Napa Range (Jepson, type).

547. Amorpha californica Nutt.; *a*, fl. branchlet x ¼; *b*, fl. x 3½; *c*, pod x 3½.

19. **PAROSÈLA** Cav. Dalea

Herbs, small shrubs or small trees. Herbage glandular-punctate. Leaves unequally pinnate or simple; stipules small, subulate; leaflets small, entire. Flowers in terminal spikes or racemes. Calyx with 5 nearly equal teeth or lobes, persistent. Banner cordate or auriculate, inserted opposite the cleft stamen-tube. Stamens monadelphous. Pod ovate, compressed, usually indehiscent, more

or less included in the calyx, 1 to 2-seeded. Seeds reniform. (Anagram of Psoralea.)

Shrubs, often very low; calyx-tube with a short turbinate base, the petals and stamens inserted at the summit of the turbinate portion; wing and keel petals with free claws or at least adnate only to very base of stamen-tube.
Leaves simple.
Stems white-pubescent, very spinose; calyx white-pubescent; ovules 4 to 6..... 1. *P. spinosa.*
Stems bright green, somewhat spinose; calyx yellowish, nearly glabrous; ovules 2. 2. *P. schottii.*
Leaves pinnate, the terminal leaflet often longer than the lateral.
Corolla large, glabrous, exceeding calyx; leaflets more or less decurrent on rachis; petioles rather long (often as long as rachis and terminal leaflet); flowers in racemes.
Leaflets more or less decurrent on rachis, mostly ovate or oblong.
Banner rounded at summit or scarcely emarginate...3. *P. arborescens.*
Banner obcordate.....4. *P. californica.*
Leaflets mostly distinct from rachis, narrowly linear or oblong..... 5. *P. fremontii.*
Corolla small, more or less pubescent, little exceeding calyx; leaflets distinct from rachis; petioles very short; flowers in very dense spikes.
Leaflets 3 to 7, rather large, the terminal conspicuously longer; calyx densely hairy.....6. *P. emoryi.*
Leaflets 7 to 13, minute, subequal.....7. *P. polyadenia.*
Herbs, sometimes a little woody at base; petals and stamens inserted at base of calyx-tube, the claws of the wing and keel petals adnate to stamen-tube for about half their length.
Flowers in loose spike-like racemes; calyx less than half length of corolla..... 8. *P. parryi.*
Flowers in heads; calyx exceeding corolla.....9. *P. mollis.*

1. **P. spinòsa** (Gray) Hel. SMOKE TREE. Fig. 548. Very spinose and nearly leafless ash-gray low shrub or small tree, 4 to 25 ft. high; branchlets numerous, reduced to slender spines 1 to 1½ (or 3) in. long; leaves few, simple, cuneate- or linear-oblong, nearly sessile, ¼ to 1 in. long, marked with a few large glands and persisting only a few weeks; spike ½ to 1 in. long; calyx-tube marked by a row of glands; corolla violet-purple, 4 to 5 lines long; ovules 4 to 6.—Common in washes, Colorado Desert; Ariz. to L. Cal. and Sonora. (Dalea spinosa Gray.)

548. Parosela spinosa Hel.; *a*, fl. branchlet x ¾; *b*, fl. x 2; *c*, banner x 2; *d*, pod x 2.

2. **P. schóttii** (Torr.) Hel. Shrubby slender somewhat spinose bush 3 to 8 ft. high; herbage bright green and nearly glabrous, or the young parts canescent; glandular dots dark, but the branches nearly glandless; leaves simple, linear, ½ to 1¼ in. long; flowers blue in loose racemes 1 to 4 in. long; calyx yellowish, 2½ to 3 lines long, obscurely glandular, its teeth low-triangular or shortly acute, ciliate-margined; corolla 4 to 5 lines long; banner obcordate; wings broadly oblong; keel-petals semi-orbicular with a strong auricular lobe at base; ovary and style pubescent; ovules 2, collateral; pods obliquely elliptic, 4 to 6 lines long, conspicuously marked with red glands, containing a single large seed.—Dry gravelly mesas, Colorado Desert; s. to L. Cal. (Dalea schottii Torr.)

3. **P. arboréscens** (Torr.) Hel. MOHAVE DALEA. Rather spiny shrub with somewhat slender branches, 2 to 3 ft. high; herbage white-tomentose (eventually quite glabrous), the upper portion of the branches with scattered short bristle-like yellow glands; leaves ¾ to 1¼ in. long, pinnately divided into 5 (3 or 7) obovate mostly subequal leaflets 3 to 4 (or 6) lines long; racemes 1½ to 2 in. long; calyx 3 lines long, its lower teeth recurving, oblong-lance-

olate or lanceolate-subulate, nearly as long as tube; fruiting calyx 5 lines long; corolla blue, 4 to 5 lines long; banner obovate; ovary and lower part of style densely white-hairy with ascending hairs; ovules 2, superposed.—Mohave Desert. (Dalea arborescens Torr. P. neglecta Parish.)

4. **P. californica** (Wats.) Vail. CALIFORNIA DALEA. Rough bush 1 to 2 (or 6) ft. high; young parts canescent, sparingly glandular, eventually more or less glabrous; branchlets eventually rigid, spinose; leaves 7 to 10 lines long, pinnately divided into 5 (rarely 3 or 7) oblong entire leaflets decurrent on rachis, 1 to 5 lines long, or the terminal leaflet sometimes notched or unequally 2-cleft or sometimes excessively developed and the 2 lateral leaflets reduced or none; racemes 2 to 3 in. long; calyx canescent, 2½ to 3 lines long, its lower teeth subulate, rather shorter than tube; corolla purple, 4 to 5 lines long; banner with a v-shaped notch; upper part of ovary and style (except tip) white-hispidulose.—San Jacinto Valley; desert slopes of the San Bernardino and San Jacinto mountains; e. to southern Utah. Very near P. fremontii. (Dalea californica Wats.)

5. **P. fremóntii** (Torr.) Vail. FREMONT DALEA. Shrub 1 to 3 ft. high; nearly glabrous or the leaves thinly canescent; leaves pinnate; leaflets 3 to 5, narrowly oblong, 3 lines long, mostly distinct from rachis; racemes loose, 3 to 5 in. long; calyx 3 lines long, finely pubescent outside and inside, its lower teeth subulate, as long as tube; corolla purple, 5 lines long; banner orbicular, notched at apex; lower portion of style and margins of ovary white-hairy with close ascending hairs; ovules 2, sub-collateral.—S. Nev. (Dalea fremontii Torr. P. wheeleri Vail.) Var. SAUNDÉRSII Mebr. Leaves soon bright green, glandular-dotted; leaflets 3 to 7 (or 9), ovate-oblong, 3 to 4 (or 6) lines long; calyx brownish, nearly or quite glabrous outside, hairy inside.—Desert slopes and mesas, 2000 to 6000 ft.: Mohave Desert; Mono Co. (Dalea saundersii Parish.) Var. JOHNSÒNII Jepson n. comb. More leafy; sparingly glandular; leaflets narrowly linear or linear-lanceolate, 3 to 10 lines long, the terminal commonly longer than the lateral; calyx often glabrous or less pubescent outside, hairy inside or with a tuft of hairs at the sinuses.—Desert slopes and mesas, Cottonwood Mts. and Ord Mt.; e. through southern Nev. to n. Ariz. and sw. Utah. (Dalea johnsonii Wats.)

549. Parosela polyadenia Hel.; *a*, fl. branchlet x ¾; *b*, fl. x 2½; *c*, pod x 2½.

6. **P. emòryi** (Gray.) Hel. Densely and divaricately branched shrub 1 to 4 ft. high, white with a close felt-like tomentum, commonly sprinkled with red glands; leaves ¾ to 1½ in. long, pinnate with 5 to 7 obovate leaflets, sometimes 3 or reduced to 1; leaflets 2 to 6 lines long, or the terminal leaflet much longer, commonly longer than the lateral; spikes very dense, capitate to oblong, ¼ to ¾ in. long; calyx 2½ to 3 lines long, 10-ribbed, rusty-pubescent, with subulate teeth as long as tube; corolla purple, 3 lines long; banner orbicular, cordate at base, the midrib very hairy on back; keel hairy on under side; style (except tip) and ovary (except base) densely short-hairy when young; ovules 2, collateral.—Colorado Desert; Ariz. to Sonora and L. Cal. (Dalea emoryi Gray.)

7. **P. polyadènia** (Torr.) Hel. Fig. 549. Stout somewhat spinose very

divaricately branched shrub 1 to 2 (or 5) ft. high; branches and leaves densely canescent, thickly sprinkled with yellowish saucer-shaped glands; leaves pinnate, 3 to 8 lines long, the petioles short or almost none; leaflets 7 to 9 (or 13), obovate, notched at apex, 1 line long; racemes dense, 4 to 7 lines long; calyx 2 lines long, hairy (especially on the teeth) and with prominent red glands between the strong callus-ribs of the tube, the teeth lanceolate or subulate, almost equaling or longer than the tube; corolla pinkish or violet, 3 lines long; banner roundish to oblong-elliptic; ovary glabrous except the hairy summit; ovules 2, collateral; style hairy with spreading hairs; seed 1.—Desert region from Owens Valley n. to Nev. (Dalea polyadenia Torr.) Var. SUBNÚDA Parish. Calyx-tube nearly or quite glabrous.—Inyo and Mono Cos. (Dalea polyadenia var. subnuda Wats.)

8. **P. párryi** (T. & G.) Hel. PARRY DALEA. Stems slender, diffusely spreading, 1 to 2 ft. long; herbage puberulent or glabrate; leaflets 6 to 10 pairs, obovate or oblong, emarginate or obtuse, ½ to 2½ lines long, with distinct petiolules; flowers 3 to 4 lines long, purple, in loose spikes; calyx turbinate, strongly ribbed, somewhat silky-canescent, its teeth ovate, acute, equaling or shorter than tube; banner ⅓ and wings ⅔ as long as keel; banner cordately reniform and with a short sharp point at apex, the center whitish and with translucent gland-dots, the purple sides turned in so as almost to make a sac; ovules 2; "pod smooth."—Mts. between the Mohave and Colorado deserts; Ariz. to L. Cal. (Dalea parryi T. & G.)

9. **P. móllis** (Benth.) Hel. Stems many from the base, 6 to 10 in. long; herbage hairy-pubescent, dotted with black saucer-shaped glands, the leaves under a lens sometimes suggesting domino pieces; leaves ¾ to 1 in. long, with 4 to 6 pairs of leaflets; leaflets obcordate to obovate or oblong, 1½ to 3 lines long; spikes very dense, 1 to 1½ in. long; calyx concealed by the dense clothing of hairs, 3 to 4 lines long; corolla pinkish, shorter than or little exceeding the subulate plumose calyx-teeth; banner reniform, hardly half length of the keel; keel very broad and blunt at tip; wings shorter than keel, notched at apex.—Colorado and Mohave deserts; Panamint Range; e. to Nev. (Dalea mollis Benth.)

20. **PSORÀLEA** L.

Ours perennial herbs. Herbage heavy-scented, punctate with dark dots. Leaves 3 or 5-foliolate; stipules free from the petiole. Flowers purple or whitish in spikes or racemes. Calyx 5-cleft. Keel broad, obtuse, joined to the wings. Stamens monadelphous or diadelphous; anthers uniform. Pod seldom exceeding the calyx, 1-seeded, indehiscent. (Greek psoraleos, scurfy or rough, the glands wart-like in some species.)

A. Plants from rootstocks; leaves pinnate with 3 leaflets; pod indehiscent, the beak short or none.

Stems prostrate; leaves and peduncles erect; flowers spicate; stamens diadelphous. . . . . 1. *P. orbicularis.*

Stems erect.
Flowers in spikes, purple.
Stamens monadelphous; peduncles shorter than the leaves. . . . . 2. *P. strobilina*
Tenth stamen nearly free; peduncles exceeding the leaves; bracts soon deciduous
Bracts shorter than the flowers; calyx-teeth a little longer than the corolla. . 3. *P. macrostachya*
Bracts as long as or longer than the flowers; calyx-teeth a little shorter than the corolla. . . . . 4. *P. douglasii.*
Flowers in racemes, whitish; stamens monadelphous.
Leaflets broadly ovate; calyx-teeth ½ to 1 line long. . . . . 5. *P. physodes.*
Leaflets lanceolate-ovate; calyx-teeth 1 to 2 lines long. . . . . 6. *P. rigida.*

B. Plants from stout thick roots; leaves palmate with 5 or 6 leaflets; pod circumscissile or bursting irregularly, the beak long.

Pedicels slender, 2 lines long; calyx-lobes nearly regular. . . . . 7. *P. californica.*
Pedicels less than 1 line long or none; calyx-lobes markedly irregular. . . . . 8. *P. castorea.*

1. **P. orbiculàris** Lindl. Stems creeping and rooting, the long-petioled leaves and peduncles erect; peduncles 10 to 24 in. long; herbage finely pubescent, the inflorescence densely whitish-villous; leaflets 2½ to 3½ in. long, the lateral pair broadly obovate, the terminal one more nearly orbicular; petioles 6 to 21 in. long; spikes 3 to 10 in. long; flowers 6 to 8 lines long;

calyx with stipitate glands scattered among the hairs, cleft almost to the base, the lowest tooth as long as the purplish corolla; pods ovate, acute, 3 lines long.—Grassy vales, meadows or creek bottoms, 500 to 4000 ft.: coastal S. Cal. and n. in the Coast Ranges to Siskiyou Co., thence s. in the Sierra Nevada to Mariposa Co.

2. **P. strobilìna** H. & A. Stems erect, 2 to 3 ft. high; herbage villous or pubescent throughout, the upper surface of the leaves subglabrous; stems, peduncles and petioles rather densely sprinkled with tack-shaped glands; inflorescence villous; leaflets orbicular to rhombic-ovate, 1¾ to 2¾ in. long; stipules membranous, narrowly ovate, acuminate, about 5 lines long; peduncles shorter than the leaves; spikes short-oblong, 1 to 2 in. long; bracts membranous, broadly ovate, abruptly acuminate, 7 to 9 lines long, deciduous; calyx 6 to 9 lines long, the lower tooth much the longest and equaling the purple corolla; ovary pubescent.—Hill country from Contra Costa Co. to Santa Cruz Co.: Saratoga; Los Gatos; Little Arthur Creek, Gilroy.

3. **P. macrostàchya** DC. LEATHER ROOT. Stems erect, 4 to 10 ft. high; herbage variable, nearly glabrous, villous-pubescent or tomentose; leaflets rhombic-ovate, sometimes ovate-lanceolate, 1 to 3 in. long; peduncles commonly much exceeding the leaves; spikes broadly cylindrical, silky-villous with white hairs, mostly 9 to 10 lines broad; calyx 3 to 5 lines long, the lower tooth a little the longest, exceeding or equaling the petals, the 4 upper teeth short, broadly lanceolate; corolla purple, the lower portion of banner dull greenish; pods hairy, ovate-oblong, acute, flattened, 3 to 4 lines long.—Along rivers and larger streams in the valleys, following the cañon bottoms in the mountains, and common in the salt marshes, always in the richest soils, 5 to 3000 ft., cismontane Cal. Our most common and widely distributed species of the genus. The roots furnished to the Pomos and other native tribes a very tough fibre.

4. **P. douglàsii** Greene. Habit of no. 3, but more slender; subglabrous, the petioles and sometimes the stems with elevated dot-like glands; leaflets rhombic-ovate, 1¼ to 2½ in. long; spikes mostly narrower (7 to 8 lines broad) than in no. 3, 2 to 3 in. long, on slender peduncles 3 to 5½ in. long; bracts deltoid and long-acuminate, caducous; rachis and calyces densely short-villous, the hairs commonly blackish, the segments of the latter just shorter than the violet corolla.—San Luis Obispo Co. to the Santa Cruz Mts. and Marin Co.; uncommon. Aug.-Sept.

550. Psoralea physodes Dougl.; *a*, fl. branchlet x ½; *b*, fl. x 1; *c*, pod x 2.

5. **P. physòdes** Dougl. CALIFORNIA TEA. Fig. 550. Stems erect, 10 to 23 in. high; herbage nearly glabrous; leaflets ovate, varying to orbicular, mostly acute, 1 to 1¾ in. long; peduncles mostly shorter than the leaves; racemes dense, ½ to 1 in. long, about as broad, the bracts small; calyx cup-shaped, covered with glands which suggest low volcanic craters, and slightly villous with usually dark hairs, about ½ as long as the corolla, at length much enlarged and inflated; calyx-teeth very short and subequal; corolla 5 to 6 lines long; petals greenish-white, the keel purple-tipped; pods suborbicular, compressed, 3 lines long.—Common in open spots on bushy or wooded slopes of the higher hills or mountains: San Gabriel and Santa

Monica mountains to Monterey, Mt. Diablo, Marin Co., Napa Range, Vaca Mts. and Siskiyou Co.; n. to B. C. Apr.-June. The herbage when dried makes a pleasant tea and was used as such by early Californians.

6. **P. rígida** Parish. Similar to no. 5; stems erect, 2 to 2½ ft. high; herbage and inflorescence with a minute scattered pubescence; leaflets mostly ovate-lanceolate, 1¼ to 3 in. long; racemes 1 to 1¾ in. long; calyx at first black-pubescent, less conspicuously glandular than in no. 5; calyx-teeth 1 to 2 lines long.—San Diego Co.: Oak Grove; Cuyamaca Mts.

7. **P. californica** Wats. Stems 5 to 8 in. high, tufted on the often branched root-crown; pubescence silky and appressed; leaves palmately compound; leaflets 5 or 6, orbicular-obovate, cuneate at base, ½ to 1 (or 1½) in. long; stipules scarious, lanceolate; racemes very much shorter than the leaves, dense, ¾ to 1 in. long, on short peduncles; calyx silky-villous, 6 lines long, the linear-acuminate lobes a little shorter than the petals; pods oblong, narrowed to a lanceolate beak, thin-walled, villous; seed dark brown, 2 lines long or more.—Mountain slopes and summits, 1500 to 5300 ft.: inner Coast Ranges from Glenn Co. to Mt. Diablo and Mt. Pinos; s. Sierra Nevada (Bodfish; Kernville); Santa Barbara Co.; San Bernardino Mts.; L. Cal.; widely distributed but a rare plant. May-July.

8. **P. castòrea** Wats. Stems ascending, 3 to 8 in. high; herbage white-pubescent; leaflets obovate-rhomboid, obtuse, ¾ to 1¼ in. long; racemes oblong, 1 to 1¼ in. long; bracts palmately 3-lobed; flowers 4 lines long; lower calyx-lobes elliptic, the others subulate, a little shorter than the corolla.—Sandy places, Daggett, Mohave Desert.

21. **GLYCYRRHÌZA** L. Liquorice

Perennial herbs with glandular-viscid herbage. Leaves odd-pinnate, glandular-dotted. Flowers yellowish-white, in axillary peduncled spikes. Calyx 5-cleft, with the 2 upper lobes shorter or partly united. Stamens mainly diadelphous, the alternate anthers smaller. Ovary 2 to many-ovuled; style short and rigid, curved at the tip. Pod bur-like, densely beset with hooked prickles, in ours oblong, few-seeded, indehiscent. (Greek glukus, sweet, and rhiza, root.)

1. **G. lepidòta** (Nutt.) Pursh. Fig. 551. Stems erect, 2 ft. high; herbage viscid-puberulent and sometimes with minute scales; leaflets 11 to 15, oblong- to ovate-lanceolate, 1 to 1½ in. long; stipules linear-subulate, spikes broadly oblong, 1 to 1½ in. long; peduncles shorter than the leaves, ¾ to 3 in. long, with spreading glandular hairs; calyx very glandular; pod ½ to ¾ in. long, reddish brown, 2 to 6-seeded.—Rich soil of low or moist lands in the valleys or on the plains, 20 to 4000 ft., throughout Cal.; n. to B. C. June.

551. Glycyrrhiza lepidota Pursh; *a*, fl. branchlet x ½; *b*, cluster of pods x ½; *c*, pod x 1

22. **KENTROPHÝTA** Nutt.

Low tufted perennials with fine silky appressed pubescence and persistent odd-pinnate leaves. Lower stipules scarious, united on the side of stem opposite the leaf; upper stipules and leaflets rigid and awn-pointed. Peduncles axillary, bearing 1 to 3 small flowers. Calyx 5-cleft. Pod 1-celled, 1 to 2-seeded, included in the calyx. Sta-

552. Kentrophyta montana Nutt.; *a*, habit x ½; *b*, leaf with stipules x 1½; *c*, fl. x 3; *d*, pod x 3.

mens diadelphous (9 and 1). Seeds large for the size of the pod. (Greek kentron, spur or prickle, and phytum, plant.)

1. **K. montàna** Nutt. Fig. 552. Stem rigid, 2 to 3 in. high; leaves crowded, the 5 to 7 leaflets subulate, spine-tipped, 2 to 5 lines long, divaricate in age; peduncles hardly over 1 line long; calyx-teeth subulate-setaceous, much longer than the campanulate tube; corolla whitish or purplish-tinged, 2 lines long; pods ovate, acuminate, 3 lines long. — Alpine crests on either side of the Owens Valley trough, 11,300 to 13,000 ft. (Mt. Dana; Mt. Warren; White Mts.). July.

23. ASTRÁGALUS L. Rattle-weed. Loco-weed

Herbs with odd-pinnate leaves and persistent stipules. Flowers purple, pale yellow or white, in spikes, racemes or heads. Racemes mostly spike-like, either the pedicels very short or the flowers crowded. Calyx 5-toothed. Corolla usually long and narrow; keel mostly obtuse. Stamens diadelphous (9 and 1). Pod turgid, or inflated and bladder-like, sometimes not inflated, 1-celled or partly or completely 2-celled by the intrusion of one or both sutures, tardily dehiscent, 2 to many-seeded. Seeds small, usually reniform on slender funiculi. (Ancient Greek name for some leguminous plant.)

I. Pods strongly inflated.

A. Pods 1-celled (seed-bearing suture sometimes slightly intruded).

1. Pods stipitate.

Stipe not more than twice as long as calyx.
Stems low and tufted.
Perennials.
Pods obovate, balloon-shaped, much rounded or obtuse at apex; leaves commonly grayish-puberulent; n. Sierra Nevada; Yollo Bolly Mts.; White Mts. ..... 1. *A. hookerianus.*
Pods broadly spindle-shaped; leaves essentially glabrous; White Mts. ..... 2. *A. oophorus.*
Annual; pods broadly ovate, acute; Providence Mts. ..... 3. *A. deserticola.*
Stems 1 to 3 ft. high, not tufted; perennials; inner South Coast Ranges.
Pod acuminate at base and at apex; calyx tube cylindric ..... 4. *A. oxyphysus.*
Pod acute at base and at apex; calyx-tube campanulate ..... 5. *A. curtipes.*
Stipe more than twice as long as calyx; perennial ..... 6. *A. leucophyllus.*

2. Pods not stipitate.

Perennials.
Pods glabrous or sparsely pubescent.
Seed-bearing suture somewhat intruded; stipules distinct.
Pods 5 to 8 lines long; w. side Colorado Desert ..... 7. *A. vaseyi.*
Pods 1 to 1¾ in. long.
Pods oblong-ovate, abruptly acute at apex, 1 to 1¾ in. long; mostly South Coast Ranges and S. Cal. ..... 8. *A. douglasii.*
Pods ovoid, gradually acute at apex, barely 1 in. long; S. Cal. ..... 9. *A. oocarpus.*
Seed-bearing suture not intruded.
Stipules meeting or united on opposite side of stem from leaf; leaflets crowded; coastal from San Francisco s. ..... 10. *A. menziesii.*
Stipules distinct; leaflets not crowded; Colorado Desert ..... 11. *A. preussii.*
Pods rather densely pubescent.
Stems 1 to 4 ft. long; leaves 3 to 5 in. long.
Pods oblong, 1 in. long; Monterey and San Luis Obispo Cos. ..... 12. *A. macrodon.*
Pods ovate, ½ in. long; in or near Mohave Desert ..... 13. *A. hornii.*
Stems 3 to 8 in. long; leaves ½ to 1 in. long; ne. Cal. ..... 14. *A. pulsiferae*

Annuals; pods densely hoary-pubescent; Colorado Desert.
Pods narrowly ovate, 2½ lines wide; branches ascending.....15. *A. aridus.*
Pods broadly ovate, 4½ lines wide; branches spreading from base..16. *A. sabulonum.*

B. Pods wholly or incompletely 2-celled.

Flowers racemose; plants 4 in. high or more.
Pods not stout-beaked, ovate.
Pods stipitate, glabrous; Sierra Nevada.....17. *A. bolanderi.*
Pods not stipitate.
Pods hoary with soft dense pubescence; annual or biennial; deserts and desert ranges.....18. *A. coulteri.*
Pods not hoary, rather sparsely pubescent; perennial; Lassen Co. and n...19. *A. lentiginosus.*
Pods stout-beaked, globose, sessile; perennial; mts. of Tulare Co.....20. *A. kernensis.*
Flowers in small heads; plants 2 to 3 in. high; pod incompletely 2-celled, sessile; perennial; high Sierra Nevada.....21. *A. platytropis.*

II. Pods not strongly inflated.

A. Perennials (except no. 22 a biennial).

1. Dorsal and ventral sutures both externally prominent, forming a thick cord-like ridge; pods coriaceous, strongly rugulose.

Pods hoary-pubescent, thin-walled, non-stipitate; biennials.....22. *A. mohavensis.*
Pods glabrous, fleshy-coriaceous; perennials.
Pods not stipitate; leaflets 5 or 7, linear, remote.....23. *A. shockleyi.*
Pods stipitate; leaflets mostly 11 to 21.
Stipe not longer than calyx; pod linear-oblong, curved; leaflets narrowly linear; Kern Co. region.....24. *A. pachypus.*
Stipe mostly longer than calyx; pod elliptic, straight, very turgid; leaflets oblong; Siskiyou Co.....25. *A. pacificus.*

2. Dorsal suture not prominent and not cord-like externally (except in A. bicristatus), in 2-celled pods often inturned and forming a groove; pods not strongly rugulose.

Pods 1-celled.
Pods glabrous, subglabrate or at least not long hairy.
Pods strongly obcompressed.
Pods stipitate, strongly cristate fore and aft by the prominent sutures.....26. *A. bicristatus.*
Pods not stipitate, not cristate fore and aft.
Leaflets obovate, 1¾ to 5 lines long; pods ¾ to 1⅛ in. long.....27. *A. iodanthus.*
Leaflets linear, 6 to 11 lines long; pods 1 to 1¼ in. long..28. *A. casei.*
Pods not obcompressed.
Pods stipitate.
Pods subcylindric.
Pods more or less curved, ¾ to 1 in. long; Alpine Co. to Plumas Co.....29. *A. gibbsii.*
Pods straight, 1 to 1¾ in. long; Siskiyou Co...30. *A. californicus.*
Pods strongly flattened laterally (except one form in A. trichopodus).
Leaflets narrowly linear; pods linear-oblong; Siskiyou Co. to Lassen Co.; inner ranges, S. Cal.....31. *A. filipes.*
Leaflets oblong; pods narrowly elliptic or linear-oblong, or mostly narrowed from above the middle toward the base (oblanceolate); coastal S. Cal.....32. *A. trichopodus.*
Pods not stipitate, ovate; coastal.....33. *A. pycnostachyus.*
Pods densely covered with long hairs, sessile.
Flowers white or blue and white, not over 1 in. long; pods curved-oblong or -ovate; peduncles shorter than the leaves.....34. *A. purshii.*
Flowers crimson, 1¼ to 1½ in. long; pods curved-broad-oblong; peduncles equaling or surpassing the leaves.....35. *A. coccineus.*
Pods wholly or incompletely 2-celled.
Pods over ½ in. long (sometimes less in no. 42).
Mature pods strongly obcompressed, sessile.
Plant tufted; pods densely woolly, moderately curved, ⅔ to 1 in. long; mts. of S. Cal.....36. *A. inflexus.*
Plant not tufted; pods pubescent, strongly curved, 1 to 2½ in. long; Mohave and Inyo Co. deserts.....37. *A. layneae.*
Mature pods not obcompressed.
Pods not stipitate.
Pods 3-angled or triquetrous; deserts.....38. *A. tricarinatus.*
Pods compressed or cylindric.
Herbage and pods strongly villous; pods reflexed or spreading; e. side Sierra Nevada.....39. *A. malacus.*
Herbage and pods not villous.
Stems not cespitose, ¾ to 1 ft. high; pods reflexed or spreading; leaflets 17 to 25; cent. Sierra Nevada foothills..40. *A. congdonii.*
Stems cespitose, not over 6 in. high; pods erect or ascending; leaflets not over 13.
Peduncles equaling or shorter than the leaves; flowers yellowish; Modoc Co.....41. *A. obscurus.*

Peduncles longer than the leaves; flowers purple-tipped; Inyo Range.....42. *A. calycosus.*
Pods stipitate.
Herbage glabrous or nearly so; stipe of pod scarcely longer than calyx-tube; Humboldt Co.....43. *A. sylvaticus.*
Herbage appressed-pubescent; stipe of pod equaling or exceeding calyx-teeth; Santa Barbara Isls.....44. *A. nevinii.*
Pods not more than ½ in. long (sometimes longer in A. andersonii), non-stipitate.
Flowers in capitate clusters or in racemes not 1 in. long.
Pod not over 2 to 3 lines long; flowers commonly many; Sierra Co. to Placer Co.
Stems slender, ½ to 2 ft. long; herbage green, thinly strigulose, the calyces not white-woolly.....45. *A. lemmonii.*
Stems stout, 2 to 4 in. long; herbage white with dense silky pubescence, the calyces white-woolly.....46. *A. austinae.*
Pod 5 to 6 lines long; flowers few; stems slender, not over ½ ft. long; Death Valley region.....47. *A. atratus.*
Flowers in racemes or spikes 1½ in. long or more.
Pods erect, very finely pubescent; calyx-teeth short and broad; Mono Co. to Modoc Co.....48. *A. mortonii.*
Pods spreading or reflexed.
Pods densely tomentose; calyx-teeth setaceous, at least as long as the tube.
Stems ½ to 1 ft. high; pods incurved; Sierra Nevada.....
49. *A. andersonii.*
Stems 3 to 4 ft. high; pods nearly straight; Los Angeles Co.....
50. *A. brauntonii.*
Pods glabrous; calyx-teeth subulate, about as long as the tube; Lake and Napa Cos.....51. *A. clevelandii.*

B. ANNUALS; PODS NOT STIPITATE.

1. Pods elliptic-ovate or ovate, 2-seeded, strongly wrinkled or ridged transversely; flowers in short racemes or spikes.

Pod erect, little exserted from the calyx.
Pod deeply 2-lobed lengthwise; mostly cismontane species.....52. *A. didymocarpus.*
Pod creased dorsally but not 2-lobed; mostly desert species.....53. *A. dispermus.*
Pod deflexed, well-exserted from the calyx.....54. *A. nigrescens.*

2. Pods linear or nearly so (oblong-ovate in no. 57), several to many-seeded, not wrinkled transversely.

Flowers in racemes; pods curved, grooved dorsally; plants silvery or hoary-pubescent; deserts.
Pods linear, compressed, 2-celled.....55. *A. albens.*
Pods lanceolate, strongly thickened and somewhat obcompressed, incompletely 2-celled.
56. *A. agninus.*
Flowers commonly in small head-like clusters at the ends of the peduncles; plants green or at least not strongly hoary-pubescent.
Pods not laterally compressed, completely or almost completely 2-celled.
Pods oblong-ovate, straight, silvery-pubescent; style in fruit stout, straight, as long as body of pod.....57. *A. breweri.*
Pods cylindric or teretish, curved, green; style in fruit short, curved or hooked, ⅛ to ⅓ as long as body of pod.
Pods grooved on back, not stipe-like at base.....58. *A. tener.*
Pods not grooved on back, drawn down to a stipe-like base, attenuate at apex.....59. *A. clarianus.*
Pods laterally compressed, incompletely 2-celled, grooved dorsally.
Pods linear-attenuate, straight or nearly so, 2 in. long; North Coast Ranges....
60. *A. rattanii.*
Pods linear, ¾ in. long, curved; desert.
Keel obtuse or acute, not prolonged at apex.....61. *A. nuttallianus.*
Keel prolonged at apex into an acute beak.....62. *A. acutirostris.*

1. **A. hookerianus** Gray. BALLOON PLANT. Stems tufted, 3 to 9 (or 12) in. high, from a woody base; leaves ¾ to 1½ in. long, puberulent, often grayish; leaflets 13 to 19, discrete, often crowded, linear to linear-oblong, 3 to 5 (or 7) lines long; flowers whitish or violet, 4 lines long, very short-pediceled in a capitate moderately dense raceme which elongates somewhat in fruit; calyx-teeth subulate, ½ as long as the campanulate tube; pods strongly inflated, obovate, rounded at apex or very obtuse (balloon-shaped), 1-celled, 1 to 2 in. long, glabrous or scantily puberulent, about 10-seeded, the stipe longer than the calyx.—Montane: e. side of the Sierra Nevada from Mono Co. to Modoc Co.; White Mts.; Yollo Bolly Mts.; w. Nev. to Ore. Var. WHITNEYI Jones. Herbage green or greenish, scantily strigose.—Sierra Nevada in Mono Co., 8000 to 12,000 ft. Var. PINOSUS Jepson n. comb. Herbage glabrous, bright green; leaflets distant.—Mt. Pinos, Ventura Co. (A. whitneyi var. pinosus Elmer.)

2. **A. oóphorus** Wats. Fig. 553. Stems many from the branched crown of a stout taproot, ascending, forming a rounded clump 8 or 9 in. high; herbage glabrous or essentially so; leaflets 6 to 9 pairs, obovate, obtuse, 2½ to 6 lines long; racemes short, ¾ to 2 in. long; flowers purplish, 6 lines long; calyx-tube deeply bowl-shaped, its subulate teeth almost as long; banner light purple, the wings white; pod strongly inflated, very broadly spindle-shaped, 1-celled, 1½ to 1¾ in. long, stiped, the stipe little exceeding the calyx-tube.—High montane, desert ranges, 7200 to 10,000 ft.: Panamint Range; White Mts.; n. into Nev. Fr. July-Aug.

553. Astragalus oophorus Wats.; *a*, fl. branchlet x ½; *b*, pods x ½; *c*, cross sect. of pod x 1.

3. **A. desertícola** Jepson n. sp. Annual, branched from base, 3 to 7 in. high; herbage strigose, gray, in age becoming green; leaves 2 to 3 in. long; leaflets 9 to 13, oblong, 4 to 7 lines long; racemes short, rather dense, on peduncles shorter than the leaves; calyx-teeth narrow, about ¾ as long as the campanulate tube; corolla dark blue, 3 to 3½ lines long; pod broadly ovate, strongly inflated, membranaceous, 1-celled, 10 lines long, on a stipe barely equaling the calyx-tube.—Providence Mts. (T. Brandegee, type). May (fr.).

4. **A. oxýphysus** Gray. Stem rigid, erect, 2 to 3 ft. high; herbage white-villous when young, soon becoming subglabrate and green; leaves 3½ to 4½ in. long; leaflets 15 to 23, oblong to linear-oblong, ½ to 1¼ in. long; racemes elongate, on peduncles longer than the leaves; calyx-teeth triangular-subulate, ⅓ as long as the cylindric tube; corolla white or greenish-white, 7 to 8 lines long; pods semi-obovate (i. e. the ventral suture nearly straight), inflated, 1-celled, 1½ to 2 in. long, with sharply pointed apex, at base attenuate into a recurved stipe 3 to 4 lines long; seeds numerous.—Inner South Coast Range from Stanislaus Co. to Fresno Co., thence s. to the upper San Joaquin Valley. Mar.-Apr. (fl. and fr.).

5. **A. cúrtipes** Gray. Stem erect, 1½ to 2¾ ft. high; herbage finely pubescent, grayish when young, the upper surface of the leaves glabrous or nearly so; leaves 3 to 4½ in. long; leaflets 19 to 33, linear, rarely oblong, cuneate at base, sometimes retuse, 5 to 8 lines long; racemes short-cylindric (1 to 2 in.), rather densely many-flowered, the peduncles longer than the leaves; calyx-teeth subulate, about half as long as the campanulate short-oblong tube; corolla whitish, 5 to 6 lines long; pods strongly inflated, ovate or obovate, acute, 1-celled, puberulent, 1¼ to 1½ in. long, pendulous on a rigid recurved stipe, little exceeding the calyx-tube; seeds many.—San Luis Obispo Co. Jan.-Apr.

6. **A. leucophýllus** T. & G. Stems erect, 1 to 3 ft. high; herbage silvery-pubescent, in age becoming green; leaves 2½ to 5 in. long; leaflets 17 to 29, linear to oblong, 5 to 13 lines long; racemes 2 to 4 in. long, rather dense, the flowers yellowish-white, 5 to 7 lines long; calyx-teeth subulate, ½ as long as the tube; pods much-inflated, oblong or ovate, abruptly short-acute, 1-celled, 1⅛ to 1¾ in. long, the valves unequal; stipe densely pubescent, ½ to 1 in. long.—Low open dry hills: inner Coast Ranges from Solano Co. to Monterey Co.; Madera Co. Apr.-June. Said to be poisonous to horses and sheep.

7. **A. vàseyi** Wats. Stems ascending or at length procumbent, 1½ to 3 ft. long; herbage somewhat canescent or the upper surface of the leaves glabrous; leaves 2½ to 3 in. long; leaflets oblong, 5 to 7 lines long; flowers purple, 4 lines long; calyx-teeth subulate, little longer than the tube; pods inflated, narrowly ovate, tapering to an acute apex, 1-celled, canescent, 5 to 8 lines long.—Desert slopes of the San Jacinto and Cuyamaca ranges. Apr. (fl. and fr.).

8. **A. douglásii** Gray. Stems many, ascending, 1¼ to 3 ft. high; herbage appressed-pubescent or in age glabrate; leaves 3½ to 5 in. long; leaflets 15 to 25, linear to oblong-linear, obtuse or retuse, 4½ to 9 lines long; racemes many-flowered, the flowers whitish or yellow, spreading; corolla 3 to 4 lines long, the calyx about ½ as long; calyx-teeth subulate, ½ to ¾ as long as the campanulate tube; pods remarkably inflated, oblong to ovate, abruptly very short acute, 1-celled, 1 to 1¾ in. long, the ventral suture slightly intruded; seeds numerous.—Foothills, 180 to 4000 ft.: w. Yolo Co.; South Coast Ranges to the mts. of S. Cal. May.

9. **A. oocárpus** Gray. Stems stout, erect or nearly so, 4 to 6 ft. high; herbage glabrous or slightly pubescent, the calyces somewhat villous-pubescent; leaves 3½ to 7 in. long; leaflets 19 to 23, narrowly oblong to ovate-oblong, ½ to 1 (or 1½) in. long; peduncles shorter than the leaves, bearing dense or rather loosely flowered racemes; flowers tawny-yellow, 4 to 5 lines long; calyx-teeth triangular-subulate, nearly half as long as the campanulate tube; pods of rather parchment-like texture, turgid and much inflated, ovoid, gradually acute at apex, nearly 1 in. long, 1-celled, the ventral suture projecting slightly inward.—Cuyamaca Mts. n. to the Conchilla Range.

554. Astragalus menziesii Gray; *a*, fl. branchlet x ⅓; *b*, fl. x 1; *c*, pods x ⅓.

10. **A. menzièsii** Gray. Fig. 554. Stems erect or decumbent, 1 to 4 ft. high; herbage grayish with appressed pubescence, often becoming green and glabrate; leaves 2½ to 5 in. long; leaflets usually many, oblong or oblong-obovate, retuse or obtuse, 6 to 10 lines long, more closely borne than in A. douglasii; racemes dense, mostly 2 to 4 in. long, the stout peduncles nearly equaling the leaves; flowers whitish, 5 to 6 lines long, early reflexed; pods ovoid, 1-celled, 1½ to 2 in. long, strongly inflated, the walls membranous.—Sandy slopes near the coast, San Francisco Co. to Monterey Co. May-July.

11. **A. preússii** Gray var. **limàtus** Jepson n. comb. Fig. 555. Robust bushy plant 1 to 2 ft. high; herbage subglabrous or sparsely strigose, the upper surface of the leaves glabrous or glabrate; leaves 2½ to 5 in. long; leaflets 11 to 15, obovate or oblong, obtuse or obcordate, ⅛ to 1⅛ in. long; racemes rather loose, on peduncles shorter or longer (in fruit) than the leaves; calyx-teeth triangular-lanceolate, about ⅓ or ¼ as long as the tube; corolla purple, 9 to 10 lines long; pods oblong-cylindric or oblong-ovate, chartaceous-inflated, obscurely puberulent or glabrate, reticulate-veined, 1-celled, many-seeded, subsessile or barely stipitate, ¾ to 1¼ in. long, 5 to 6 lines broad.—Colorado Desert. Apr. (fl. and fr.). (A. limatus Sheld.)

12. **A. mácrodon** Gray. Stems much branched at base, 1 to 2 ft. high; herbage densely villous-pubescent, somewhat glabrate in age; leaves 3 to 4 in. long; leaflets 19 to 23, linear or linear-oblong, 4 to 8 lines long; racemes rather loosely few-flowered; calyx-teeth nearly as long as the narrow - campanulate tube; corolla yellowish, 3 to 4 lines long; pods 1-celled, strongly inflated, short-oblong or ovate, abruptly short-pointed at apex, densely puberulent, in age subglabrate.—Upper Salinas River valley; very local species. June-July (fl. and fr.).

13. **A. hórnii** Gray. SHEEP LOCO. Fig. 556. Stems slender, widely spreading, 3 to 4 ft. long; herbage rather sparsely appressed-pubescent or the stems and upper surface of the leaves glabrate; leaves 3 to 5 in. long; leaflets about 21, narrowly oblong, obtuse, 4 to 8 lines long; flowers numerous in a dense short or capitate spike which is equally dense in fruit (¾ to 1¾ in. long) and is borne on a peduncle surpassing the leaves; calyx-teeth subulate, about as long as the campanulate tube; corolla yellowish-white; pods broadly ovate, acuminate, straight, 1-celled, pilose, 6 to 15-seeded.—Infrequent; San Bernardino Valley and n. through the Mohave Desert to the upper San Joaquin Valley (Tulare and Kern Cos.) and Inyo Co.; e. to Utah. Aug.-Oct. It is reported as poisonous to sheep.

555. Astragalus preussii var. limatus Jepson; *a*, fl. branchlet x ½; *b*, fl. x 1; *c*, fl. x 1; *d*, wings & keel x 1; *e*, pods x ½.

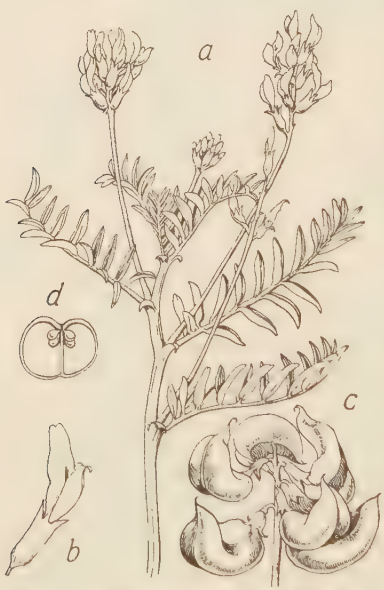
556. Astragalus hornii Gray; *a*, fl. branchlet x ½; *b*, pods x ½; *c*, cross sect. of pod x 2.

14. **A. pulsíferae** Gray. Stems slender, prostrate, branching, 3 to 8 in. long, arising from the branched crown of a slender taproot; herbage (including mature pods) whitish-villous; leaves ½ to 1 in. long, the 9

to 11 leaflets crowded; leaflets narrow-obovate, mostly retuse, 1½ to 4 lines long; pedicels in fruit often 2 to 4 lines long; calyx-teeth linear-filiform, longer than the tube; corolla white, purplish-tinged, 2 lines long; pods ovate-inflated, 1-celled, 4 to 6 lines long, 3 to 8-seeded.—N. Sierra Nevada from Plumas Co. to Shasta and Modoc Cos., about 4000 ft. July.

15. **A. áridus** Gray. Profusely branched from base, 6 to 9 in. high; herbage and pods silvery-pubescent, often glabrate; leaves 1½ to 2 in. long; leaflets 9 to 15, oblong to obovate, 3 to 5 lines long; flowers few, yellowish-white, 2½ lines long, in loose racemes on peduncles shorter than the leaves; calyx about half as long as corolla, the slender teeth about as long as the tube; pods sessile, narrowly ovate, somewhat incurved, inflated, 5 to 6 lines long, 1-celled, several-seeded.—Colorado Desert. Apr.

16. **A. sabulònum** Gray. Diffusely branched from base, 3 to 10 in. high, gray with close strigose pubescence; leaves 2 to 3 in. long; leaflets 9 to 15, linear-oblong, 3 to 5 lines long; racemes short, loose, rather few-flowered, the flowers 2½ to 3 lines long; calyx-teeth lanceolate-subulate, a little longer than the tube; pods incurved-ovate, short-acuminate, ½ to ¾ in. long, 1-celled, pubescent; seeds several.—Colorado Desert, 300 to 500 ft.; e. to Nev. Apr. (fr.).



557. Astragalus bolanderi Gray; *a*, fl. branchlet x ½; *b*, fl. x 1; *c*, pods x ½; *d*, cross sect. of pod x 1.

17. **A. bolánderi** Gray. Fig. 557. Stems many, erect, from the branched crown of a heavy woody root, 9 to 12 in. high; herbage pubescent; stipules scarious, the lower united on the side of the stem opposite the leaf; leaves 3 to 6 in. long; leaflets 9 to 23, linear to narrowly oblong; peduncles not exceeding the leaves, bearing a short crowded 6 to 12-flowered raceme; calyx-teeth slender-subulate, a little shorter than the tube; corolla white or purplish-tinged, 5 to 6 lines long; pod narrowly ovate-inflated, incurved, coriaceous, glabrous, veiny, 7 to 10 lines long, on a stipe equaling or slightly exceeding the calyx, more or less grooved along both sutures, incompletely 2-celled, the apical ⅓ partitionless; seeds 12 or 14. — Sierra Nevada from Tulare Co. to Placer Co., 5200 to 9000 ft. June-July.

18. **A. còulteri** Benth. Annual or biennial; stems usually several from a tough or almost woody base, widely branched, ⅓ to 1 ft. high; whole herbage hoary with a dense covering of short silky appressed hairs; leaves 2 to 3½ in. long; leaflets 11 to 15, oblong to obovate, obtuse or retuse, 3 to 7 lines long; racemes cylindric, loose, 10 to 20-flowered, the peduncles mostly shorter than the leaves; calyx-teeth slender, about half as long as the tube; corolla purple, 4 to 5 lines long; pods ovate-inflated, sharp-pointed, 8 to 9 lines long, chartaceous, purplish-mottled, densely pubescent with soft short hairs, conspicuously grooved dorsally, 2-celled except at the apex; seeds numerous.—Colorado and Mohave deserts, n. to Inyo Co. May (fl. and fr.).

19. **A. léntiginòsus** Dougl. SPOTTED LOCO. Branched from base, 5 to 9 (or 12) in. high; herbage sparsely strigose-pubescent or glabrate; leaves 1 to 2½ in. long; leaflets 11 to 21, oblong to obovate, ¼ to ½ in. long; peduncles shorter than the leaves, bearing short-oblong racemes of crowded flowers; flowers white or purplish, 3 to 4 lines long; calyx-teeth lanceolate-

subulate, ½ to nearly as long as the tube; pods broadly ovate, rather abruptly pointed, membranous-inflated, straw-color (almost as if shining), incurved, often purplish-mottled, 5 to 7 lines long, more or less grooved along both ventral and dorsal sutures, 2-celled except at apex; seeds many.—E. side of the Sierra Nevada in Lassen Co.; n. to Wash. Apr.-May.

20. **A. kernénsis** Jepson n. sp. KERN LOCO. Perennial with many slender stems, 3 to 4 in. high, from the woody crown of a stout root; herbage strigose-pubescent with stiffish hairs, the upper surface of the leaflets merely bordered by strigose hairs; stipules scarious, distinct; leaves 1 to 2 in. long; leaflets about 13, obovate, obtuse or retuse, 1½ to 2½ lines long; racemes short, rather closely 4 to 6-flowered, the whitish flowers 4½ lines long; calyx-teeth subulate, about half the length of the narrow-campanulate tube; banner notched, its sides turned abruptly back; wings involute-tubular, shorter than banner, turning bluish; keel shorter than wings; pods globose, membranous-inflated, abruptly beaked, 3 lines long, more or less grooved along both sutures, 2-celled; seeds about 4.—High Sierra Nevada of Tulare Co., Volcano Creek, 8200 ft. (Jepson 4930, type). July (fl. and fr.).

21. **A. platýtropis** Gray. Peduncles and leaves tufted on the crown of a taproot, 2 to 3 in. high; herbage silvery-pubescent; leaves 2½ to 3½ in. long; leaflets 7 to 13, obovate or oblong, 1½ to 3 lines long; flowers (5 or 6) in capitate racemes on slender scape-like peduncles, the peduncles about equaling the leaves; calyx-teeth subulate, nearly as long as the tube; corolla yellowish-white with purplish keel, 3½ to 4½ lines long; pods turgid-ovate, very short-pointed, scantily strigulose, sometimes purplish-mottled, 2-celled except at the apex, 1 in. long.—Mts. near Sonora Pass, Sierra Nevada, 10,000 ft.; e. to Nev. Rare. July (fl. and fr.). The large inflated pod is in size out of proportion to this diminutive alpine plant.

22. **A. mohavénsis** Wats. Fig. 558. Biennial, much-branched from a somewhat woody base, ¼ to 1 ft. high; herbage appressed, silky-villous, or the stems glabrate; stipules triangular, distinct; leaves 1½ to 2½ in. long; leaflets about 11, roundish-obovate to oblong-obovate, 3 to 6 lines long; racemes loosely few-flowered, the peduncles shorter than the leaves; calyx-teeth narrow, about equaling the turbinate tube; corolla blue, 4½ to 5 lines long; pods oblong, somewhat compressed, coriaceous, rugulose, incompletely 2-celled, hoary-pubescent, 6 to 9 (or 12) lines long, both sutures prominent and cord-like externally; seeds many. — Desert ranges, e. Mohave Desert to the Death Valley region. May.

558. Astragalus mohavensis Wats.; *a*, fr. branchlet x ½; *b*, infl. x ½; *c*, cross sect. of pod x 2.

23. **A. shóckleyi** Jones. Stems 1½ to 2 ft. high, freely branching; herbage hoary-pubescent or in age (especially the stems) glabrate; leaves 3½ to 4½ in. long, the rachis thick and stem-like, the 2 or 3 pairs of leaflets very remote; leaflets linear, ¾ to 1¼ in. long; pods oblong, 7 to 9 lines long, subsessile, partially or in age completely 2-celled.—White Mts.

24. **A. páchypus** Greene. Fig. 559. Stems branching, 1½ to 4 ft. high; herbage densely silvery-puberulent, the leaves soon glabrate, especially

559. Astragalus pachypus Greene; *a*, leaf x ½; *b*, infl. x ½; *c*, pods x ½; *d*, cross sect. of pods x 2.

above; leaves 3 to 5 in. long; leaflets 15 to 21, narrowly linear, retuse or obtuse, 4 to 12 lines long; racemes loosely few-flowered, equaling the leaves; calyx-teeth subulate, equaling the campanulate tube; corolla yellowish or white, 8 lines long; pods narrowly oblong, slightly incurved when mature, incompletely 2-celled, ¾ to 1 in. long, shortly thick-stiped, fleshy when young, in age coriaceous and rather strongly rugulose, both sutures extremely prominent and cord-like; seeds about 12.—Foothills, 2000 to 5300 ft.: Tehachapi Range, w. to the Cuyama Valley, s. to Cajon Pass. May-June (fl. and fr.).

25. **A. pacíficus** Sheld. Stems erect or ascending from a stout root-stock, 1 to 2 ft. high; herbage thinly pubescent with soft woolly hairs; leaves 2½ to 3½ in. long; leaflets 9 to 19, oblong, usually cuneate at base, sometimes obovate, retuse, 3 to 6 lines long; racemes short (¾ to 1¼ in. long), loosely flowered, the peduncles equaling or exceeding the leaves; calyx-teeth slender, nearly equaling the tube; corolla yellowish, 5 to 7 lines long; pods elliptic, 2-celled, very turgid, about as thick as broad, abruptly mucronate, ½ to ¾ in. long, glabrous, fleshy-coriaceous, strongly rugulose, reflexed or ascending, upon a stipe nearly twice as long as the calyx-tube, the ventral suture externally prominent and cord-like, the dorsal suture less so; seeds 8 or 10.—Siskiyou Co.; n. to Ore. July (fr.).

26. **A. bicristàtus** Gray. Stems diffusely branched from a suffrutescent base; herbage strigulose, the hairs of the inflorescence commonly black; leaflets 13 to 19, not crowded, linear, obtuse, 5 to 11 lines long; flowers yellowish-white, 6 to 7 lines long, rather numerous in loose racemes; calyx-teeth triangular-subulate, about ½ as long as the campanulate tube; corolla twice as long as calyx, the blunt keel strongly upcurved at tip, the banner conspicuously longer; pods oblong, strongly obcompressed, prominently 2-keeled, somewhat curved, conspicuously wrinkled or veined, 1-celled, glabrous, 1 to 1¼ in. long; seeds numerous.—Open desert slopes or cañon floors, 5500 to 7000 ft., San Gabriel Mts. and San Bernardino Mts. June-July.

27. **A. iodánthus** Wats. Stems many from the branched crown of a taproot, ascending or procumbent, 6 to 12 in. long; herbage glabrous or essentially so; leaves 1½ to 2½ in. long; leaflets 11 to 15, obovate, obtuse or retuse, 1¾ to 5 lines long; raceme ½ to ¾ in long; flowers 4 to 5 lines long, pale blue; calyx-teeth setaceous, ¾ as long as tube; pods narrowly oblong, strongly flattened contrary to the partition, curved or moon-shaped, dorsally grooved, acuminately beaked, 1-celled, glabrous or scantily puberulent, ¾ to 1⅛ in. long.—Montane valleys or slopes, 5000 to 6000 ft.: along the e. side of the Sierra Nevada from Washoe Co., Nev., to Esmeralda Co., Nev., rarely in valleys on its eastern crests (Sierra Co., Cal.).

28. **A. càsei** Gray. Fig. 560. Similar to no. 26, especially in flowers and foliage; diffusely branching, 9 to 10 in. high, seemingly glabrous but sparingly strigulose; leaves 2 to 3 in. long; leaflets 11 to 13, distant, linear, 6 to 11 lines long; pods oblong in outline, strongly flattened contrary to the sutures, conspicuously beaked, 1-celled, scantily strigulose, 1 to 1¼ in.

long; beak stout, acuminate, inflexed but straight. — Death Valley region; n. through western Nev.

29. **A. gíbbsii** Kell. Stems rather stout, branching, 1 ft. high; herbage with a short spreading pubescence, often grayish; leaves 2½ to 3½ in. long; leaflets 15 to 21, obovate, retuse or obcordate, 3 to 7 lines long; flowers yellowish-white, 6 to 9 lines long, numerous in dense racemes, borne on peduncles exceeding the leaves; calyx-teeth triangular, ⅓ to ¼ the length of the oblong-campanulate tube; pod sub-cylindric, more or less curved, 1-celled, pubescent or subglabrate, ¾ to 1 in. long, on a stipe 6 to 7 lines long.—N. Sierra Nevada, towards crest or eastern slope, from Plumas Co. to Alpine Co.; w. Nev. to Ore. and Ida. May-June.

30. **A. califórnicus** Greene. Stems commonly several from a stout woody base, ¾ to 2 ft. high; herbage pubescent, becoming glabrate; leaves 1 to 2½ in. long; leaflets 13 to 19, oblong, emarginate, sometimes merely obtuse, acute at base, 3 to 7 lines long; racemes short, the peduncles surpassing the leaves; flowers yellowish, 5 to 6 lines long; calyx-teeth triangular-subulate, ¼ to ⅓ as long as the tube; pods linear, sub-cylindric, straight, 1 to 1¾ in. long, 1-celled, glabrous or puberulent, often purplish-mottled, spreading horizontally, tapering to a stipe 3 to 7 lines long.—Siskiyou Co. May-June. Very near A. collinus Dougl., which has pendulous pods 6 to 8 lines long (Ore. to Wash.).

560. Astragalus casei Gray; *a*, fr. branchlet x ½; *b*, infl. x ½; *c*, cross sect. of pod x 1½.

31. **A. filipes** Torr. Stems slender, many from base, closely erect, 1 to 2 ft. high; herbage glabrous or sparingly strigose-pubescent; leaves 2 to 3½ in. long; leaflets 9 to 17, rather distant, narrowly linear, ¼ to ¾ in. long; racemes long-peduncled, loosely flowered; calyx-teeth broad, about ¼ as long as the campanulate tube; corolla yellowish-white, 4 to 5 lines long; pods spreading or pendulous, linear-oblong, acute, compressed, 1-celled, glabrous, ½ to 1 in. long, rather shortly tapering at base into a stipe 3 to 4 lines long.—Siskiyou Co. to Lassen and Modoc Cos.; n. to Wash. June. Var. INVÉRSUS Jepson n. comb. Stems flexuous, straggling; herbage very sparsely pubescent with strigose hairs; leaflets 7 to 11, linear to filiform; calyx-teeth triangular; flowers 4½ lines long; pods straight or slightly recurved.—Lava beds, Plumas Co. to Shasta and Modoc Cos. (A. inversus Jones.) Var. RESÍDUUS Jepson n. var. Ventral margin of pods straight or straightish, the dorsal margin slightly curved.—Valleys and mountain slopes near the desert from the Santa Rosa Mts. (Cahuilla Valley, Jepson 1469, type) to Mt. Pinos.

32. **A. trichópodus** Gray. Stout, rigid, erect, 1 to 3 ft. high; herbage rather thinly strigose-puberulent or the upper surface of the leaves glabrous; leaves 3 to 5½ in. long; leaflets numerous, narrowly oblong or cuneate-oblong, obtuse to retuse, 4 to 9 lines long; racemes short, commonly dense, the peduncles commonly shorter than the leaves; pedicels recurved in fruit; calyx-teeth triangular-subulate, ⅓ as long as the campanulate tube; corolla yellowish-white, 4 to 6 lines long; pods compressed or somewhat inflated, narrowly elliptic, acute at apex and base, 1-celled, glabrous, 6 to 11 lines long, 3 lines broad, pendulous on a filiform minutely pubescent stipe 3 to 6 lines long.—Santa Barbara Co. to Los Angeles Co. Mar.-May. Var. GAVIÒTUS

561. Astragalus trichopodus var. antisellii Jepson; *a*, leaf x ½; *b*, pods x ½; *c*, fl. x 1; *d*, cross sect. of pod x 2.

34. **A. púrshii** Dougl. Stems from a long taproot, 2 to 4 (or 8) in. long, forming densely matted tufts; herbage densely white-woolly; leaves 1¼ to 2½ in. long; leaflets 9 to 19, cuneate-oblong, 3 to 5 lines long; peduncles shorter than the leaves, bearing at the tip (3 to) 5 or 6 flowers; calyx-teeth slender-subulate, ¼ to ½ as long as the narrow tube; corolla white or white and blue, 7 to 11 lines long; pods oblong, 1-celled, densely clothed with long white or yellowish hairs so as to appear like pellets of wool, 5 to 8 (or 10) lines long; beak none or the pod apex short-acute.—Mendocino Co. to Siskiyou and Modoc Cos.; ranging south in a color form on the east side of the Sierra Nevada to Inyo Co. and recurring in the inner South Coast Range; n. to B. C., e. to Rocky Mts. Var. TÍNCTUS Jones. Flowers purple.—Siskiyou and Modoc Cos. s. to Inyo Co. Var. LONGÍLOBUS Jones. Pod more or less obcompressed, rather strongly beaked, 7 to 9 lines long; beak straightish, inflexed, ⅕ to ½ as long as the body.—Desert side of the Sierra Nevada from Siskiyou Co. to New York Mts. and Tehachapi Range, thence n. to San Carlos Range. Var. LÉCTULUS Jones. Leaflets fewer; pe-

Jepson n. comb. Pods flat, semi-obovate, very densely clustered, 8 to 12 lines long, 3½ to 4 lines wide, the ventral suture straight or nearly so.—Coastal Santa Barbara Co.; Santa Catalina Isl. (A. gaviotus Elmer.) Var. ANTISÉLLII Jepson n. comb. Fig. 561. Leaflets oblong; pods flat, oblanceolate to oblong-oblanceolate, abruptly acute, 10 to 13 lines long, 2½ to 3 lines wide.—Common in the mts., San Luis Obispo Co. to Los Angeles Co. (A. antisellii Gray.)

33. **A. pycnostàchyus** Gray. Fig. 562. Stems rather stout, 1 to 3 ft. high; herbage grayish with a soft pubescence; leaves 2 to 3 in. long; leaflets 23 to 31, narrowly oblong, crowded, ½ to ¾ in. long; peduncles a little shorter than the leaves; flowers whitish or the wings yellowish, 4 to 5 lines long, closely sessile in dense oblong or cylindric spikes; calyx-teeth subulate, about ½ as long as the broadly campanulate tube; pods ovate, acute, beaked with the persistent style, 1-celled, glabrous, veined, retrorsely imbricated, 4 to 4½ lines long; seeds few.—Along the coast from Los Angeles to Humboldt Co. July-Aug.

562. Astragalus pycnostachys Gray; *a*, fl. branchlet x ½; *b*, pods x ½; *c*, cross sect. of pod x 2½.

563. Astragalus coccineus Bdg.; *a*, habit x ½; *b*, pod x ½; *c*, cross sect. of pod x 1.

duncles shorter; flowers smaller (4½ lines long); pods smaller (3 lines long). — High montane, 6000 to 10,000 ft., San Bernardino Mts. to the southern Sierra Nevada in Tulare Co.

35. **A. coccíneus** Bdg. Fig. 563. Densely tufted from a stout taproot, 3½ to 6 in. high; herbage densely white-silky; leaves 2 to 4 in. long; leaflets 11 to 15, obovate to broadly ovate, obtuse, 3 to 6 (or 7) lines long; spikes numerous, rather few-flowered, the flowers short-pedicellate, crowded near the top; calyx about half as long as the corolla, the linear-subulate teeth about ⅓ the length of the cylindrical tube; corolla scarlet, straight, 1¼ to 1½ in. long; pods oblong, 1-celled, 1 to 1½ in. long.—Desert ranges, 3000 to 8000 ft.: w. Colorado Desert; Inyo Co. Apr.-May.

36. **A. infléxus** Dougl. var. **leucólobus** Jepson n. comb. Caespitose from a somewhat woody base, 2 to 5 in. high, hoary throughout with dense soft pubescence; stipules triangular, 2 to 3 lines long; leaves 2 to 3 in. long; leaflets 11 to 19, obovate to oblong, 2½ to 6 lines long; racemes rather loosely few-flowered, the peduncles equaling or surpassing the leaves; calyx-teeth triangular-subulate, ¼ as long as the cylindric tube; corolla purple and white, 8 lines long; pods narrowly oblong, markedly obcompressed, incurved, broadly grooved dorsally, 8 to 12 lines long, densely but rather closely tomentose, nearly or quite 2-celled except at apex; seeds about 12.—Mts. of S. Cal., 6000 to 8000 ft., from the Santa Rosa Mts. to the San Bernardino Mts. and San Gabriel Mts. May-June. (A. leucolobus Jones.) Var. ORDÉNSIS Jepson n. var. White-woolly throughout with long loose hairs or the calyx black-hairy; stipules lanceolate, 6 lines long; leaves 2½ to 3½ in. long; leaflets oblong or obovate, 4 to 6 lines long; pods oblong, incurved, somewhat obcompressed, incompletely 2-celled, densely shaggy tomentose, like pellets of wool. — Ord Mt., Mohave Desert (Jepson 5877, type). Var. FLOCCULÀTUS Jepson n. var. Fig. 564. Like var. ordensis but the leaves 1½ to 2 (or 3) in. long, exceeding the peduncles a little; leaflets 2½ to 3 lines long; stipules triangular, 3 lines long. — Panamint Mts., Hanaupah Cañon (Jepson 6999, type).

564. Astragalus inflexus var. flocculatus Jepson; *a*, habit x ⅓; *b*, infl. x ½; *c*, cross sect. of pod x 1½.

37. **A. làyneae** Greene. Fig. 565. Diffusely spreading, ½ to 1½ ft. high, the stems commonly very short, the leaves mostly basal or sub-basal; herbage densely appressed-villous, gray or at length subglabrate and greenish; the calyces often black-

565. Astragalus layneae Greene; *a*, fr. branchlet x ½; *b*, infl. x ½; *c*, pod x 1; *d*, cross sect. of pod x 2.

hairy; leaves 3 to 6 in. long; leaflets 13 to 23, roundish-obovate, obtuse, 3 to 9 lines long; racemes loose, elongate, many-flowered, the peduncles longer or shorter than the leaves; calyx-teeth triangular, ¼ to ⅓ as long as the tube; corolla white, purple-tipped, 6 to 8½ lines long; free filament very short; pods linear, acute or acuminate, obcompressed, strongly incurved, hairy-pubescent or glabrate, often purplish-mottled, 1 to 2 in. (or 2½) in. long, incompletely 2-celled, the inturning of the dorsal suture forming a broadly V-shaped groove; seeds 10 to 20. — Sandy washes, Mohave Desert to Inyo Co. Apr.-May (fl. and fr.).

38. **A. tricarinàtus** Gray. Stems ½ to 1 ft. high, branching from base; herbage canescent; leaves 1½ to 2½ in. long; leaflets 11 to 17, linear to narrowly oblong, mostly truncatish or notched at apex, 3 to 8 lines long; peduncles longer than the leaves, bearing a loose raceme of whitish or yellowish flowers; flowers ½ in. long; calyx-teeth subulate, about as long as the campanulate tube; pods glabrous, triquetrous, straight or slightly curved, 7 to 12 lines long, incompletely 2-celled; seeds 8 or 10.—Mohave and Colorado deserts. May.

39. **A. málacus** Gray. Erect, ½ to 1 ft. high, the stems and basal leaves forming a dense tuft on the branched crown of the taproot; herbage villous with spreading hairs; leaves 2½ to 3¾ in. long; leaflets 11 to 17, obovate, obtuse or truncatish, 4 to 9 lines long; peduncles surpassing the cauline leaves; spikes closely many-flowered, ¾ to 1½ in. long, elongating in fruit; calyx dark-hairy, the slender teeth much shorter than the cylindric tube; corolla deep purple, 6 to 7 lines long; pods rigid, linear-oblong, slightly curved, shallowly grooved dorsally, incompletely 2-celled, 1 in. long, widely spreading on recurved pedicels; seeds many.—E. side of the Sierra Nevada from Modoc Co. to Inyo Co.; w. Nev. to Ore. May.

40. **A. congdònii** Wats. Stems more or less branched, commonly decumbent at base, ¾ to 1 ft. high; herbage loosely whitish-pilose; leaves 1½ to 2½ in. long; leaflets 17 to 25, obovate to oblong, retuse or obtuse, 2 to 3 lines long; racemes very loose, elongate, on peduncles longer than the leaves; calyx-teeth triangular-subulate, nearly as long as the tube; corolla yellowish-white, 5 to 6 lines long; pods linear, curved, somewhat compressed, puberulent, pendulous, grooved on the back, incompletely 2-celled, 1 in. long; seeds numerous.—Sierra foothills from Amador Co. to Mariposa Co. May (fl. and fr.).

41. **A. obscùrus** Wats. Stems wiry or slender, numerous in a broom-like tuft on a branched root-crown, 3 to 5 in. high; herbage appressed-pubescent; leaves 2 to 3 in. long; leaflets 5 to 13, linear to oblong, 2 to 5 lines long; peduncles equaling or shorter than the leaves; racemes loosely few-flowered, the yellowish flowers 4 lines long; calyx-teeth subulate, more than half as long as the campanulate tube; pods linear, straight, not flattened, coriaceous, lightly strigose-pubescent, 6 to 9 lines long, incompletely 2-celled, the dorsal suture intruded; seeds 6 to 8.—Modoc Co.; Nev. to Ore. June (fl. and fr.).

42. **A. calycòsus** Torr. Densely tufted on a branched root-crown, 1 to 3 (or 6) in. high, the leaves and peduncles basal; herbage densely silvery-silky; leaves 1 to 3 in. long; leaflets 1 to 2 (rarely 5) pairs, obovate to oblong, 2 to 5 lines long; racemes 2 to 6 (or 8)-flowered, on peduncles exceeding the leaves; calyx-teeth subulate, ½ as long as the campanulate tube; corolla 4 to 5 lines long, purple-tipped; pods oblong, straight or slightly curved, finely but densely strigose, 5 to 7 lines long, deeply grooved dorsally and thus incompletely 2-celled; seeds about 10.—High montane, 8000 to 11,000 ft., Inyo Range; n. and e. through the ranges of Nev. and Ariz. June (fl. and fr.).

43. **A. sylváticus** Wats. Stems clustered, ascending, ¾ to 1¼ ft. high; herbage glabrous or nearly so; leaves 2½ to 4 in. long; leaflets 13 to 23, elliptic to oblong, retuse, 4 to 8 lines long; racemes short, densely flowered, the flowers and fruit reflexed, the peduncles equaling or exceeding the leaves; calyx slightly pubescent, its teeth slender-acuminate, about equaling the tube; corolla yellowish-white, 3½ lines long; pods glabrous, linear, compressed, curved, grooved dorsally, incompletely 2-celled, ¾ to 1 in. long, shortly stipitate; seeds 6 or 8.—Humboldt Co.; n. to Ore. June.

44. **A. nevínii** Gray. Low, the herbage gray with appressed pubescence; leaves 2 to 3 in. long; leaflets cuneate-obovate, notched at apex, 3 to 4½ lines long; racemes many-flowered, subcapitate; calyx-teeth lanceolate, at least half the length of the tube; corolla white; pod 2-celled, rather broadly linear-lunate, reticulate, glabrous or nearly so, stipitate, strongly grooved dorsally, 8 lines long.—Santa Barbara Isls. Aug. (fl. and fr.).

45. **A. lemmònii** Gray. Stems slender, several to many from the root-crown, ½ to 2 ft. long, soon procumbent; herbage strigulose; leaves ¾ to 1¼ in. long; leaflets 9 to 13, linear to linear-oblong, 3 to 5 lines long; peduncles filiform, shorter than the leaves; flowers whitish, tinged with purple, 1½ to 2 lines long, few to many, crowded in a capitate raceme; calyx-teeth setaceous-subulate, equaling or longer than the short-campanulate tube; pod puberulent, ovate-oblong, 2 to 2½ lines long, grooved dorsally, incompletely 2-celled; seeds few.—Sierra Valley. May-June.

46. **A. austìnae** Gray. Stems densely tufted, 2 to 4 in. long, from a woody root-crown; herbage silvery-pubescent; stipules scarious, mostly united into one ovate body opposite the leaf; leaves 1 to 1¼ in. long; leaflets 9 to 17, oblong or ovate-lanceolate, 2 to 4 lines long; peduncles equaling or exceeding the leaves, bearing 10 to 12 nearly sessile flowers in a dense head; calyx-teeth filiform, longer than the campanulate tube; corolla whitish, 3 to 4 lines long, persistent, with villous wings and banner; pods sessile, densely pubescent, somewhat obcompressed, grooved dorsally, incompletely 2-celled, 2½ to 3 lines long (not equaling the calyx and corolla); seeds few.—Dry exposed ridges, alpine at 8000 to 11,000 ft. on the eastern crests of the n. Sierra Nevada from Placer Co. to Nevada Co.; e. to Nev. July.

47. **A. atràtus** Wats. var **panamintènsis** Jepson n. comb. Slender, 4 to 6 in. high, branched from a somewhat woody base; herbage strigulose; leaves 2½ to 3½ in. long; leaflets 9 to 11, narrowly linear, acute, 2 to 3 lines long; stipules distinct, triangular; racemes 2 or 3-flowered, on slender peduncles shorter than the leaves; calyx-teeth subulate, about as long as the tube; corolla yellowish tipped with purple, 5½ lines long; pods linear, straight, 5 to 6 lines long, chartaceous, nearly glabrous, deeply grooved dorsally, incompletely 2-celled.—Panamint Range. Apr. (A. panamintensis Sheld.) Var. MENSÀNUS Jones. Plant ashy; leaflets elliptic to oblong; pods flattened, 1 in. long, 2 lines wide, short-stipitate.—Darwin Mesa.

48. **A. mortònii** Nutt. Stout, often widely branched from base, ½ to 2 ft. high; herbage strigulose; leaves 3 to 5 in. long; leaflets 13 to 21, oblong to obovate, obtuse or acute, 6 to 9 lines long; peduncles shorter or longer than the leaves; racemes densely flowered, spike-like, in fruit very crowded and 1½ to 2¼ in. long; flowers greenish-white or cream color, 6 to 7 lines long, reflexed as they open, the fruit erect; calyx-teeth triangular, not half as long as the broadly oblong tube; pods subcylindric or narrowly oblong, straight,

grooved dorsally, incompletely 2-celled, 5 to 6 lines long, the ventral suture externally prominent; seeds numerous.—E. side of the Sierra Nevada from Mono Co. to Modoc Co.; e. to Utah, n. to Ore. Aug.

49. **A. andersònii** Gray. Stems several, somewhat tufted, from a woody root-crown, ½ to 1 ft. high; herbage grayish with silky-villous pubescence; leaves 1 to 3½ in. long; leaflets 13 to 25, oblong or obovate, 3 to 5 lines long; peduncles surpassing the leaves; racemes closely flowered, 1 to 1¾ in. long; calyx-teeth subulate-setaceous, about as long as the campanulate tube; corolla yellowish-white or pinkish, 6 lines long; pods sessile, linear-oblong, compressed, curved, grooved dorsally, incompletely 2-celled, 6 to 8 lines long; seeds 16 to 20.—E. side of the Sierra Nevada from Inyo Co. to Lassen Co.; e. to western Nev. May.

50. **A. brauntònii** Parish. Stems erect or reclining, 3 to 4 ft. high; herbage gray-tomentulose; leaves 4 to 6 in. long; leaflets numerous, oblong, truncate or obtuse, 3 to 6 lines long; racemes cylindric, densely flowered, the flowers and fruit reflexed, the peduncles shorter than the leaves; calyx-teeth very narrow, longer than the tube; corolla light purple, 4 lines long, the banner prominent; pods sessile, oblong, slightly curved, beaked, tomentose, grooved dorsally, incompletely 2-celled (the apical portion without partitions), 3 to 4 lines long; seeds 2 or 3 on each side of the partition-fold.—Santa Monica Mts., Los Angeles coast. May.

566. Astragalus clevelandii Greene; *a*, fl. branchlet x ⅓; *b*, fl. x 2½; *c*, pod x 2½; *d*, cross sect. of pod x 4.

51. **A. clevelándii** Greene. Fig. 566. Stems stoutish, erect, branching, 1 to 2½ ft. high; herbage puberulent, becoming glabrate; leaves 2 to 3 in. long; leaflets 15 to 23, narrowly oblong to lanceolate, 2½ to 7 lines long; racemes narrow, 3 to 6 in. long, on peduncles longer than the leaves; calyx-teeth subulate, about equaling the tube; corolla white or cream-color, hardly over 2 lines long; pods curved, ovate-lanceolate, strongly grooved on the back, reticulate, glabrous, incompletely 2-celled, 2 to 2½ lines long, on recurved pedicels.—Mountain valleys and cañons, Lake and Napa Cos. July-Aug. (fr.).

52. **A. dídymocárpus** H. & A. Stems slender, commonly diffusely branched from base, 3 to 12 in. high; herbage strigulose, the calyx hairs mostly blackish; leaflets 9 to 15, oblong to linear, cuneate, deeply notched at apex, 2½ to 5 lines long; spikes oblong-elliptic to capitate, very densely flowered, 3½ to 7 (or 12) lines long, the peduncles commonly exceeding the leaves; flowers remaining erect; corolla white and violet, 1½ to 2 lines long, scarcely exceeding the calyx; pods short-ovate, deeply 2-lobed lengthwise by the intrusion of the dorsal suture, incompletely 2-celled, corrugated by strong transverse ridges, 1 to 1½ lines long; seeds 2.—Interior valleys and foothills, 50 to 3100 ft.: South Coast Ranges and San Joaquin Valley, s. through the Mohave Desert to San Diego Co. (reaching the coast southward); L. Cal. Mar.-Apr.

53. **A. dispérmus** Gray. Similar to no. 52; herbage grayish, strigulose; calyx conspicuously white-villous; pods mostly narrow-ovate, less wrinkled, creased by the dorsal suture but not deeply 2-lobed, 1 to 1¼ lines long.—Mohave and Colorado deserts; e. to Ariz., s. to L. Cal.

567. Astragalus nigrescens Nutt.; *a*, fl. and fr. branchlet x ½; *b*, fl. x 3½; *c*, pod x 5; *d*, cross sect. of pod x 3.

54. **A. nigréscens** Nutt. Fig. 567. Slender, many-branched from base, 4 to 12 in. high; herbage rather sparsely appressed-pubescent, the calyces and often the stems with black hairs; leaves ¾ to 1 in. long; leaflets 7 or 9 to 13, narrowly cuneate-oblong, emarginate, 2 to 4 lines long; racemes 4 to 8 lines long, several-flowered, on slender peduncles, exceeding the leaves; flowers soon curving downward; calyx-teeth narrow, about equaling the tube; corolla 1 line long, violet or violet-tipped; pods deflexed, 1½ lines long, well-exserted from the calyx, hirsute-pubescent, strongly obcompressed, deeply grooved on the back, incompletely 2-celled, with slender wavy transverse ridges which are more prominent at the margins; seeds 2.—Foothills, Coast Ranges from Humboldt Co. to San Luis Obispo Co., frequent; s. to the San Bernardino Valley; also Sierra Nevada foothills, but rare. Mar.-May.

55. **A. álbens** Greene. Stems many from base, diffuse, 5 to 6 in. high; herbage silvery-pubescent; leaves 1 to 2 in. long; leaflets 5 to 11, obovate, obtuse, 2½ to 4 lines long; racemes loose, few-flowered, the peduncles shorter than the leaves; calyx-teeth lanceolate-subulate, nearly as long as the turbinate tube; corolla purple, 3 lines long; pods sessile, linear, compressed, curved, strongly grooved dorsally, 2-celled, pubescent, 6 lines long.—Desert side of the San Bernardino Mts.; local species. May.

56. **A. agninus** Jepson n. sp. Annual with slender taproot; stems several from the base, often zigzag, ½ to 1½ ft. high, hoary-canescent throughout; stipules distinct, triangular, scarious; leaves 2 to 3 in. long; leaflets 7 to 13, obovate to oblong, obtuse or retuse, 3 to 5 lines long; raceme somewhat loose, 1½ to 2 in. long, the purplish flower 4 lines long; calyx-teeth subulate, about ½ as long as the narrow-campanulate tube; pods lanceolate, somewhat curved, somewhat obcompressed, membranous, densely hoary-pubescent, grooved dorsally, very slightly if at all inflated, 7 to 9 lines long, the fold in-growing from the dorsal suture, extending half way or nearly to the ventral suture; seeds 8 or 10; style slender, persistent in fruit and curved or hooked.—Borrego Sprs., w. Colorado Desert (Jepson 8883, type). Apr. (fl. and fr.).

568. Astragalus breweri Gray; *a*, habit x ½; *b*, pod x 1½; *c*, cross sect. of pod x 6.

57. **A. bréweri** Gray. Fig. 568. Stems filiform or nearly, branching, 1 to several from base, 3 to 9 (or 12) in. high; herbage sparsely strigulose or subglabrous, the calyces often black-

569. Astragalus tener Gray; *a*, habit x ⅔; *b*, pods x ⅔; *c*, fl. x 1; *d*, cross sect. of ovary x 2⅔.

hairy; leaves 1¼ to 1½ in. long; leaflets 7 to 11, obovate to narrowly oblong-cuneate, obtuse to obcordate, 2 to 4 lines long; heads closely (3 or) 5 to 9-flowered, the flowers violet-purple tinged, 4 to 4½ lines long; calyx-teeth lanceolate-subulate, about equaling the tube; pods ovate or oblong-ovate, whitish-pubescent, 2-celled, grooved on the back, 3 to 4 lines long, beaked with the now elongated very stout straight style; seeds 6.—North Coast Ranges from Mendocino Co. to Marin Co. Apr.

58. **A. téner** Gray. Fig. 569. Slender, branched from base, 3 to 9 in. high, minutely appressed-pubescent; leaves 1 to 1¾ in. long; leaflets 9 to 15, linear or cuneate, acute or emarginate, 3 to 5 lines long; flowers purplish, 5 lines long, in heads or short racemes, the slender peduncles longer than the leaves; calyx-teeth subulate, more than half as long as the narrow-campanulate tube; pods linear, sub-cylindric, 5 to 7 lines long, lightly appressed-pubescent, strongly grooved on the back by the inturning of the dorsal suture, completely 2-celled; style persistent in fruit, short, hooked; seeds 6 to 10.—Mostly alkaline flats or plains: Sacramento Valley, s. to Monterey Co. May (fr.).

59. **A. clarianus** Jepson n. sp. Fig. 570. Branching from or near the base, 3 to 6 in. high; herbage green, lightly strigulose; leaves 6 to 9 lines long, nearly twice as long as the petioles; leaflets 7 to 9, oblong, emarginate, acutish at base, 2 to 3 lines long; flowers 2 to 6, in a subcapitate cluster; calyx dark-pubescent, its acute teeth less than ½ as long as the tube; corolla white, the banner and keel with purple spot at apex, 5 to 6 lines long; pods subterete, curved, drawn down to a stipe-like base, attenuate at apex, minutely pubescent, almost completely 2-celled, 1 to 1¼ in. long; style persistent, curved.—Rocky hill-slopes, Napa Range: near St. Helena (Clara A. Hunt, type); Conn Valley.

60. **A. rattánii** Gray. Fig. 571. Stems several to many from base, 4 to 14 in. high; herbage sparsely strigose-pubescent, the upper surface of the leaves glabrous; leaves 1¼ to 2 in. long; leaflets 11 to 15, narrowly cuneate-obovate or -oblong, emarginate, 2 to 5 lines long; flowers in capitate clusters terminating peduncles longer than the leaves; calyx-teeth lanceolate-subulate, more than half as long as the campanulate tube; corolla violet or white, 4 to 5 lines long; pods 3 to 7 in a capitate cluster, narrowly linear, atten-

570. Astragalus clarianus Jepson; *a*, habit x ½; *b*, fl. x 1½; *c*, cross sect. of pod x 3.

571. Astragalus rattanii Gray; *a*, fl. branchlet x ½ ; *b*, pods x ½ ; *c*, cross sect. of pod x 6.

uate, compressed, grooved dorsally, almost 2-celled, 2 to 2¼ in. long; seeds many. — North Coast Ranges from Lake Co. to Humboldt Co. May (fl.)-June (fl. and fr.).

61. **A. núttallianus** DC. Stems several from the base, diffuse or prostrate, 3 to 10 in. long; herbage pubescent with stiffish white appressed hairs; leaves in a basal tuft and scattered along the branches, ½ to 1¼ in. long; leaflets 9 to 13, linear to oblong, acute at base and apex, 2½ to 3 lines long; flowers capitate, the peduncles slender, exceeding the leaves; calyx-teeth narrow, about as long as the tube; corolla whitish or purplish, 2 to 2½ lines long, the keel with obtuse or acute inflexed or upturned tip; pods nearly or quite 2-celled, linear, somewhat curved, compressed, deeply grooved dorsally, 7 to 9 lines long; seeds 14 to 16.—Inyo Co. s. through the e. Mohave Desert to the Colorado Desert, thence w. to San Jacinto Valley; far e. to Ark. May.

62. **A. acútiróstris** Wats. Fig. 572. Like A. nuttallianus; apex of corolla keel prolonged into a beak.—W. Colorado Desert; Mohave Desert; n. to Inyo Co. Apr.-May (fl. and fr.).

24. **OXÝTROPIS** DC.

Differing from Astragalus only in the keel which is prolonged at the apex into a slender beak. (Greek oxus, sharp, and tropis, keel.)

Herbage silky-villous; leaves 3 to 6 lines long . . . . . 1. *O. oreophila.*
Herbage viscid-pubescent; leaves 2½ to 3 in. long . . . . . 2. *O. viscida.*

1. **O. oreóphila** Gray. Leaves and peduncles densely tufted or matted on the root-crown, 1 to 2½ in. high; herbage silvery-pubescent; leaflets 5 to 11, oblong to ovate, 1½ to 2½ lines long; peduncles scapose, longer than the leaves, bearing at the summit a capitate cluster of purplish flowers 4 to 5 lines long; pods strongly ovate-inflated, densely grayish-pubescent, 5 lines long, grooved ventrally and the ventral suture bearing a narrow intruded fold, the dorsal suture plane.—Mt. San Gorgonio, San Bernardino Mts., 9000 to 11,000 ft.; e. to Utah. Aug. (fl. and fr.).

2. **O. víscida** Nutt. Stems caespitose from a stout branching root-crown, 4 to 6 in. high; herbage viscid-pubescent, strongly scented; leaves 2½ to 3½ in. long; leaflets 25 to 33,

572. Astragalus acutirostris Wats.; *a*, habit x ¼ ; *b*, fl. x 1½ ; *c*, pod x 1½ ; *d*, cross sect. of pod x 3.

573. Olneya tesota Gray; *a*, leaf with stipular spines x ½; *b*, fl. branchlet x ½; *c*, calyx spread open x 1½; *d*, pod x ½.

oblong, revolute, acute, 2 to 3 lines long; peduncles equaling or exceeding the leaves, bearing rather dense subcylindric spikes of whitish flowers 5½ lines long; corolla with strongly beaked keel; pods terete, incompletely 2-celled by intrusion of the seed-bearing suture.—White Mts., 12,200 ft.; n. to Ore. July (fl. and fr.).

25. **ÓLNEYA** Gray

Tree with thin scaly bark, the branches armed with stout spines in pairs below the leaves. Leaves pinnate, with entire leaflets. Flowers few, in axillary racemes. Banner orbicular, deeply emarginate. Stamens diadelphous (9 and 1). Style bearded above. Pod thick, 1 to 5-seeded, tardily dehiscent. (S. T. Olney, 1812-1878, Rhode Island botanist.)

1. **O. tesòta** Gray. DESERT IRONWOOD. Fig. 573. Broad-crowned tree 15 to 25 ft. high; leaves 1½ to 3 in. long; leaflets 5 to 8 pairs, cuneate-oblong or -obovate, 3 to 10 lines long; spines 1 to 4 lines long; racemes loose, ½ to 1¼ in. long; flowers violet-purple, 4 to 5 lines long; pods oblong, more or less pubescent and often provided with tack-shaped glands, ½ to 3 in. long, 1 to 8-seeded, more or less constricted between the seeds; seeds ovoid-globose, 4 to 6 lines long.—Desert valleys, Colorado Desert; Ariz. to Sonora and L. Cal. The wood is remarkably hard and heavy and is used by desert Indians for arrow parts and tool-handles.

26. **SESBÀNIA** Pers.

Herbs or shrubs with pinnate leaves and numerous entire leaflets. Flowers commonly yellow, 1 to several on slender axillary peduncles. Calyx broadly campanulate with 2 deciduous bractlets at base. Banner circular or oval; wings oblong; keel blunt. Stamens diadelphous (9 and 1). Ovary mostly stipitate, many-ovuled. Fruit elongated-linear, partitioned between the seeds. (Sesban, Arabic name of one of the species.)

1. **S. macrocárpa** Muhl. COLORADO RIVER HEMP. Fig. 574. Annual, 3 to 10 ft. high; leaves exceeding the flowers; leaflets 13 to 41 pairs, narrowly oblong to linear, mucronulate, 5 to 14 lines long; calyx-teeth short, acute, salient; corolla yellowish, brownish-mottled, 6 to 7½ lines long; pods 4 to 9 in. long, 1 to 2⅓ lines wide.—Very abundant on overflow lands along the

574. Sesbania macrocarpa Muhl.; *a*, fl branchlet x ¾; *b*, pod x ⅓.

lower Colorado River, e. to the Atlantic, s. to Cent. Am. It is a fiber plant producing white lustrous smooth and very strong filaments which are used by the Yuma Indians for nets and fish-lines.

27. VÍCIA L. Vetch. Tare

Annual or perennial herbs with weak angular stems, often slightly climbing. Leaves pinnate, with several to many leaflets and semi-sagittate stipules, the rachis ending in a simple or branched tendril. Flowers solitary or racemose, axillary, the racemes one-sided. Calyx 5-toothed, the three lower teeth often longer. Banner oblong, or appearing so by the turning back of the edges; wings united to the middle of the keel. Stamens diadelphous (9 and 1) or monadelphous below. Style filiform with a tuft of hairs below the stigma all around or sometimes only on the back. Pod flat, 2 to several-seeded. Seeds globose, the funiculus expanded above to cover the hilum, thus arillate. Cotyledons remaining under ground in germination. (Classical Latin name.)

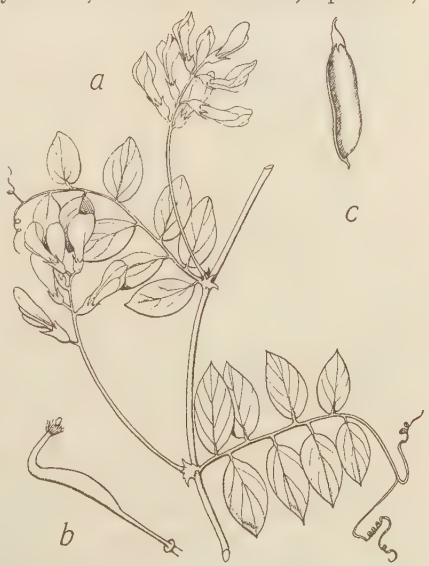
Annuals; flowers few, 1 or 2 in the axils.
- Flowers subsessile ..... 1. *V. sativa.*
- Flowers on elongated peduncles ..... 2. *V. exigua.*

Perennials; flowers several to many, in a raceme on an elongated peduncle.
- Leaflets 8 to 12; peduncles 3 to 8-flowered.
  - Herbage glabrous or nearly so; stems straightish ..... 3. *V. americana.*
  - Herbage finely pilose-pubescent; stems zig-zag ..... 4. *V. californica.*
- Leaflets 16 to 30.
  - Flowers reddish-purple; peduncles 7 to 18-flowered; pods blackening in drying .. 5. *V. gigantea.*
  - Flowers bright blue-purple; peduncles 16 to 30-flowered; pods not blackening in drying ..... 6. *V. semicincta.*

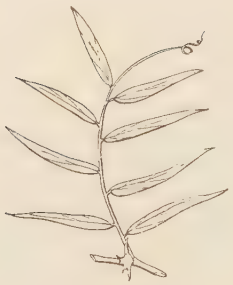
1. **V. sativa** L. Common Vetch. Tare. Stems slender, 1½ to 2¾ ft. high; leaflets 6 to 12, glabrous, or the margins slightly ciliate, oblong or narrower, often cuneate, truncate or retuse, mucronate, ⅔ to 1 in. long; stipules small, toothed; flowers solitary or geminate, nearly sessile, the pedicels 1 line long at most; corolla 8 to 10 lines long; banner purple, wings red; calyx-teeth subulate-setaceous, longer than the tube; pods 1½ in. long; seeds 1½ lines in diameter.—Nat. from Eur.; occasional throughout cismontane Cal.

2. **V. exígua** Nutt. California Vetch. Very slender, 1 to 2 ft. high; leaflets 4 to 12, oblong to narrowly linear, acute or obtusish, apiculate; peduncles filiform, shorter than the leaves, ½ to 2 in. long, 1 or 2-flowered; flowers 2 to 3 lines long, white or purplish; pods glabrous, 4 or 5-seeded, 1 in. long.—Stony or sandy soil: Napa Co. and San Joaquin Co. to S. Cal. Apr. Var. hásseI Jepson. Stouter; leaflets of at least the lower leaves deeply notched at apex, the notch mucronate; pod 5 to 8 or sometimes only 3-seeded.—Benicia; Livermore; S. Cal.

3. **V. americàna** Muhl. American Vetch. Fig. 575. Stems 2 to 3 ft. long, trailing or climbing by branched tendrils, sharply 4-sided or winged at the angles; herbage nearly glabrous; leaflets broadly oblong, usually widest above the middle, obtuse, mucronulate, ½ to 1¼ in. long; peduncles shorter than the leaves, 4 to 7 or 8-flowered; flowers at first purplish, changing to bluish, 9 lines long; calyx-tube 2 lines long, the lower teeth the longer (1 line long), the upper approximate, incurved; pods

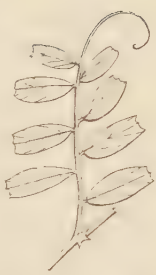


575. Vicia americana Muhl.; *a*, fl. branchlet x ½; *b*, pistil x 2; *c*, pod x ½.



576. Vicia americana var. linearis Wats.; leaf x ½.

1¼ to 2 in. long; seeds globose, dull black, 2 lines in diameter.—Foothills, 50 to 4700 ft.: coastal S. Cal.; Coast Ranges; Sierra Nevada. Feb.-May. There are intergrades to the varieties. Var. LINEÀRIS Wats. Fig. 576. Leaflets 1 to 1½ in. long, ½ to 1½ lines wide; pods 1 in. long.—Range of the species. Var. TRUNCÀTA Brew. Fig. 577. Leaflets truncate at apex and 3 to 5-denticulate; pods ¾ to 1 in. long.—Range of the species.



577. Vicia americana var. truncata Brew.; leaf x ½.

4. **V. californica** Greene. Stems zigzag, erect or decumbent, 5 to 11 in. long; herbage finely villous-pubescent; leaflets 8 to 12, elliptic to cuneate-obovate, truncate with the apex 3 to 5-denticulate, 3 to 8 lines long; racemes 3 to 6-flowered.—Mountain slopes, 4000 to 6000 ft.; mts. of S. Cal.; Sierra Nevada from Tulare Co. to Siskiyou Co., thence s. to Humboldt Co. It intergrades to no. 3 and seems insufficiently distinct.

5. **V. gigantea** Hook. GIANT VETCH. Fig 578. Stems stout, somewhat pubescent, climbing several feet high, often forming extensive tangles and draperies over shrubs; leaflets narrowly oblong or tapering somewhat from the base to the obtuse mucronulate apex; calyx short, lower teeth about equaling the tube; corolla red-purple or pale saffron, 6 to 7 lines long; pod oblong, 1½ in. long, glabrous, glaucous, 3 or 4-seeded; seeds globose, velvety black, 2 lines in diameter.—Along streams near the coast from Monterey Co. to Humboldt Co.; n. to Alas. Mar.-June. The herbage blackens in drying.

578. Vicia gigantea Hook.; *a*, fl. branchlet x ⅛; *b*, fl. x 1; *c*, pod x ½.

6. **V. semicincta** Greene. Stems 3 to 4 ft. high, striate-angled; herbage puberulent; leaflets 16 to 24, linear, approximate, ¾ to 1¼ in. long; racemes equaling or surpassing the leaves, densely flowered, 1¼ to 1¾ in. long; corolla bright blue-purple, 5 lines long; pods ¾ in. long, glaucescent, few-seeded; seeds dull black.—Fields, Goose Lake Valley, n. Modoc Co.; also se. Ore.

28. LÁTHYRUS L. PEA

Herbs, ours perennial. In technical character and in habit very similar to Vicia. Raceme commonly one-sided. Banner roundish or very broad. Upper teeth of calyx commonly shorter than the lower. Leaflets usually larger, in ours 3 to 5 pairs, mostly mucronate; rachis in some species not prolonged into a tendril. Style flattish, hairy along the upper side only, that is, next the free stamen. (Old Greek name of the pea.)

Stems angled.
Tendrils short and unbranched or none.
Herbage villous.
Plants decumbent; stipules larger than the leaflets; tendrils none; peduncles longer than the leaves, 2 to 6-flowered.....1. *L. littoralis.*
Plants erect; stipules smaller than the leaflets; tendrils none or reduced to a point; peduncles much shorter than the leaves, 1 or 2-flowered..
2. *L. torreyi.*
Herbage glabrous or pubescent.
Leaflets thin, the mucro minute; tendrils simple; herbage puberulent.....
3. *L. nevadensis.*
Leaflets thick, coriaceous, glaucous, the mucro stout and twisted; tendrils none or reduced to a point; herbage glabrous.....4. *L. rigidus.*
Tendrils long, branched or simple.
Leaflets linear, equaling or exceeding the rachis.....5. *L. graminifolius.*
Leaflets shorter than the rachis.
Herbage more or less pubescent; stipules ¼ to ¾ in. long.
Flowers deep red; w. Riverside and San Diego Cos....6. *L. splendens.*
Flowers not deep red.
Flowers dull white, the banner purple-veined or purplish; Santa Cruz Co. to Humboldt Co.....7. *L. vestitus.*
Flowers rose-pink or flesh-color, the banner with purple veinlets; coastal S. Cal. and n. to Monterey Co.....8. *L. strictus.*
Herbage glabrous; stipules ¾ to 1¾ in. long.
Ovary pubescent; tendrils mostly unbranched; stipules as large as and simulating the leaflets.....9. *L. maritimus.*
Ovary glabrous; tendrils branched; stipules small or large, not resembling the leaflets.
Racemes slender; flowers turning sordid.....10. *L. sulphureus.*
Racemes stout; flowers fading blue or yellowish.....
11. *L. polyphyllus.*
Stems winged; tendrils long, branched.
Herbage puberulent; stipules ¼ to ¾ in. long.....12. *L. californicus.*
Herbage glabrous or nearly so; stipules ½ to 1¾ in. long.....13. *L. jepsonii.*

1. **L. littorâlis** (Nutt.) Endl. BEACH PEA. Fig. 579. Stems many from creeping rootstocks, stout, decumbent; herbage densely silky-villous, suggestive of a hairy Lupine; leaflets 1 to 3 pairs with a usually smaller or imperfect terminal one, cuneate-oblong, 4 to 6 lines long; stipules ovate or somewhat hastate, 2 to 3 times as large as the leaflets; peduncles exceeding the leaves; calyx-teeth nearly equal, as long as the tube; corolla 6 to 8 lines long; banner purple, the keel and wings white or nearly so; pod oblong, 1 in. long, villous, 3 to 5-seeded.—Seashore, Santa Cruz Co. to Del Norte Co.; n. to Wash.

579. Lathyrus littoralis Endl.; *a*, fl. branchlet x ½; *b*, fl. x 1; *c*, pod x ½.

2. **L. tórreyi** Gray. Stems erect, very slender, 4 to 9 in. high; herbage light green, sparingly villous; leaflets thin, elliptic to ovate or oblong, 5 to 7 lines long; leaves with a terminal leaflet or the rachis merely ending in a point; stipules small, semi-sagittate, lanceolate, the lower lobe very short; flowers solitary or in 2s, the peduncles 4 to 12 lines long; calyx-teeth subulate, exceeding the tube, or the upper shorter and broader; corolla 6 lines long; banner pale lilac, keel and wings white; pod linear-oblong, pubescent, 1 in. long, 3 to 5-seeded.—Shady woods: Santa Clara Co. to Humboldt Co.; n. to Wash. The herbage is possessed of a lasting fragrance.

3. **L. nevadénsis** Wats. Stems loosely soft-pubescent or sparsely puberulent, 5 to 18 in. high; leaves sparsely pubescent; stipules 3 to 8 lines long; leaflets 3 to 6 pairs, narrowly or broadly elliptic, acute or obtuse at both ends, apiculate or mucronulate, usually rather thin, sometimes small and thick, ¾ to 1¾ in. long; tendrils

commonly short and unbranched; peduncles usually shorter than the leaves, few-flowered; calyx-teeth triangular-acuminate, the lower somewhat the larger; corolla reddish-purple fading to blue, sometimes yellowish-white, ½ to ¾ in. long; keel abruptly upward-turned or right-angled.—Foothills and mts., 2000 to 7000 ft.: Napa Co. to Siskiyou Co., thence to Plumas Co. and s. in the Sierra Nevada to Mariposa Co. (L. nuttallii Wats.)

4. **L. rígidus** White. Stems slender, angled, ascending, 6 to 10 in. high; herbage glabrous and somewhat glaucous; stipules narrow; leaves coriaceous, 1 to 2½ in. long; leaflets 4 to 10, oblong-oblanceolate, 7 to 11 lines long; tendrils reduced or none; peduncles exceeding the leaves; racemes 2 to 5-flowered; corolla 8 to 11 lines long, white.—Plains and low hills, n. Modoc Co.; n. to Ore.

5. **L. gráminifòlius** White. Stems 6 to 14 in. high; herbage glabrous, or sometimes loosely pubescent; stipules narrow-lanceolate; rachis of leaves 1 to 2 in. long, the leaflets linear, pointed, 1 to 3 in. long; tendrils simple or branched; peduncles ½ to 2½ in. long, 2 to 4-flowered; corolla white, often pink or purple-tinged, 4 lines long.—Open forest, 4400 to 6000 ft., Siskiyou Co. to Lassen Co., thence s. in the Sierra Nevada; e. to N. Mex., s. to Mex.

6. **L. spléndens** Kell. CAMPO PEA. Stems climbing 2 to 4 ft. high, angled; herbage minutely pubescent or subglabrous; leaflets about 8, linear to elliptic-ovate, very variable (even on one individual), 10 to 14 lines long; stipules variable; racemes 4 to many-flowered; corolla deep red, 1 to 1¼ in. long.—Mts. of Riverside and San Diego Cos.; s. to L. Cal. A remarkably showy species.

7. **L. vestìtus** Nutt. Stems angled, low and herbaceous, or climbing 3 to 7 ft. high on shrubs and woody below; stipules broadly or narrowly semi-sagittate; leaflets finely puberulent, dark green, lighter on the under surface, 8 to 12 lines long, 2 to 4½ lines wide, tapering to both ends from the middle, usually more acute at apex than at base, mucronulate; racemes many-flowered; lowest calyx-teeth lanceolate, nearly equaling or exceeding tube; corolla dull white, turning sordid in age, 7 to 8 or 9 lines long, the banner violet-veined, sometimes pink-tinged; seed with a small aril.—Foothills, open or wooded slopes, 100 to 2500 ft.: Santa Cruz Co. to Alameda Co. and n. to Tehama and Humboldt Cos.; n. to Ore.

8. **L. stríctus** Nutt. Similar to L. vestitus and most likely distinct from it only varietally; stouter; leaflets elliptic to linear, acute, commonly pubescent, 8 to 15 lines long; stipules 2 to 5 lines long; flowers rose-pink or flesh color or whitish with red or purple or lavender veinlets.—Foothills and mountains, 2000 to 5500 ft.: Monterey Co. and Tehachapi Mts. to the San Jacinto Mts. and San Diego Co.; s. to L. Cal. (L. violaceus and L. lactiflorus Greene.) Var. ALFÉLDII Jepson n. comb. Stipules nearly half as large as the leaflets.—Palomar to San Diego. (L. alfeldii White.) Var. BÁRBARAE Jepson n. comb. Leaflets elongated-linear, ¾ to 2 in. long, mostly 1 to 2 lines wide.—Santa Barbara; Palomar Mt. (L. violaceus var. barbarae White.) Var. THÁCHERAE Jepson n. var. Subglabrous; leaves 1 to 1½ in. long; basal lobes of stipules narrow (lanceolate to subulate).—Ojai Valley, Ventura Co. (Olive Thacher 22, type).

9. **L. marítimus** Bigelow. Stems stout, 1 to 2 ft. high, at length decumbent; herbage glabrous; leaflets elliptic, obtuse at apex, mucronulate, ¾ to 1¾ in. long; stipules broadly ovate, acute, as large as the leaflets; upper calyx-teeth ½ to ¾ as long as the lower; corolla purple, ¾ in. long; ovary heavily glandular-pubescent.—Sandy seashore, Humboldt Co. to Del Norte Co.; n. to Alas., e. to Lab.; Eur.

10. **L. sulphùreus** Brew. Stems rather stout, 1 to 2 ft. high; herbage glabrous; leaflets 6 to 12, not closely paired or commonly distinctly alternate on the rachis, oblong-ovate to elliptic, cuspidate at apex, ¾ to 2 in. long; stipules small or large, mostly broad; peduncles 2 to 4 in. long; racemes 6 to 25-flowered; pedicels recurved; corolla dull white or the banner slightly pinkish, turning yellowish-brown, 5 to 7 lines long; upper calyx-teeth much

shorter than the lower; banner short, pink- or purple-veined in the middle.—Foothills, 2200 to 5500 ft.: Lake Co. to Trinity Co.; Sierra Nevada from Plumas Co. to Tulare Co.

11. **L. polyphýllus** Nutt. Stem erect, angled, 1½ to 2½ ft. high; herbage rather light-colored, perfectly glabrous; leaflets narrowly ovate to elliptic-ovate, obtuse at base and apex, mucronulate, ¾ to 2½ in. long; stipules half to as large as the leaflets, ovate, acuminate or ovate-lanceolate, dilated below into a rounded toothed lobe, 3 to 9 lines broad; racemes 5 to many-flowered; lower calyx-teeth distinctly longer than tube; corolla rose-purple, fading blue or yellowish, 7 to 8 lines long.—Vicinity of the ocean: Mendocino Co. to Del Norte Co.; n. to B. C., s. in a slightly modified form to the Oakland Hills and San Francisco. Var. INSECÚNDUS Jepson n. var. Raceme not one-sided, the subulate calyx-lobes very prominent in bud.—Olema, Marin Co. (Jepson, type).

12. **L. califórnicus** Wats. Stems erect, stoutish, strongly winged, or at least evidently winged, 1½ to 2½ ft. high, or climbing 4 to 6 ft.; herbage light green, glaucous, finely pubescent or subglabrous; leaflets 1 to 3 in. long, 3 to 11 lines wide, tapering from the middle to each end, acute, mucronate, strongly several-nerved from or near the base, the nerves branching little and almost parallel; stipules semi-sagittate, narrow, the upper lobe lanceolate, the lower lobe little dilated, commonly entire; racemes 4 to 18-flowered, on peduncles 3 to 7 in. long; calyx sparingly to densely pubescent; lower calyx-teeth lanceolate, subequal, longer than tube; pod 2 in. long, 4 lines broad; corolla white, the banner pink-veined and soon pink-flushed, all the petals sordid in age, 8 to 10 lines long; seed with a small aril.—Sandy places in valleys or along streams, 50 to 4000 ft.: Sierra Nevada foothills from Tuolumne Co. to Shasta Co.; Sacramento Valley; inner North Coast Ranges from Siskiyou Co. to Solano Co.; Oakland Hills; Mt. Hamilton Range. (L. watsonii White.)

580. Lathyrus jepsonii Greene; *a*, fl. branchlet x ⅓; *b*, wing x 1; *c*, pistil x 1½; *d*, pod x ½.

13. **L. jepsònii** Greene. Fig. 580. Stems 4 to 8 ft. high, climbing, strongly winged along the angles; herbage glabrous; leaflets 8 to 12, linear-lanceolate, 1 to 1½ in. long; stipules semi-sagittate, both the apical and basal lobes lanceolate or oblong; peduncles mostly shorter than the leaves; corolla rose-purple, 8 to 9 lines long; lower calyx-teeth unequal, the middle one equaling the tube; pods 1¾ to 2¼ in. long, 3 to 4 lines wide.—Deltas or marshes: Suisun Marshes; lower Sacramento isls. Aug.-Oct.

29. ALHÁGI Desv.

Spiny shrub. Leaves simple, entire, deciduous. Flowers few in racemes. Calyx short-campanulate, subequally toothed. Stamens diadelphous. Banner with incurved margin. Pods linear, incompletely 2-celled, constricted between the seeds. (The Mauretanian name.)

1. **A. camelórum** Fisch. CAMEL THORN. One to 2 ft. high; spines numerous, slender, ½ to 1 in. long; flowers lavender-red, 4 to 5 lines long.—Nat. from Asia Minor; Mecca, Colorado Desert.

LINÀCEAE. Flax Family

Herbs. Leaves alternate, or sometimes opposite, small, entire, without stipules or these sometimes replaced by a gland. Flowers mostly in cymose panicles, perfect, regular, in ours 5-merous. Petals distinct, very quickly falling. Stamens 5, slightly united at base. Styles 2 to 5, distinct. Cells of the superior ovary as many as the styles, or twice as many by the formation of a false division wall from the back of each cell, these false partitions frequently not complete. Fruit a capsule, splitting through the false partitions and frequently also septicidal.

1. LÌNUM L. Flax

Our only genus. (Ancient Latin name of these plants.)

Perennial; styles 5; flowers blue; petals without ventral appendages.....1. *L. lewisii.*
Annuals; styles 2 or 3.
Styles 2; petals without ventral appendages; flowers yellow; sepals irregularly serrate or lacerate; upper leaves serrate.....2. *L. digynum.*
Styles 3; petals commonly with ventral appendages at base; sepals entire, or sometimes minutely ciliate-glandular.
Leaves closely margined with stipitate glands; pedicels 1 to 5 lines long, discrete.
Flowers yellow; leaves linear.....3. *L. adenophyllum.*
Flowers pink; leaves ovate.....4. *L. drymarioides.*
Leaves entire, not ciliate-glandular.
Pedicels more or less elongated and flowers thus distinctly separate from one another; stem much branched and repeatedly dichotomous above the simple base.
Flowers yellow, the petals 1 to 1½ lines long.....5. *L. clevelandii.*
Flowers pinkish or white.
Petals about 3 lines long; pedicels straight....6. *L. spergulinum.*
Petals about 2 lines long; pedicels curved at apex.....
7. *L. micranthum.*
Pedicels short, the flowers in rather close clusters.
Flowers white, pink or rose-purple.....8. *L. californicum.*
Flowers bright yellow.....9. *L. breweri.*

1. **L. lewísii** Pursh. Blue Flax. Stems several from a woody root-crown, erect, thickly clothed with leaves, simple below the corymbosely branched summit, 1½ to 3 ft. high; herbage glabrous; leaves linear-lanceolate or linear, acute, 5 to 11 lines long; flowers in terminal loose and somewhat corymbose clusters, or racemose on the branches; corolla blue, 6 to 8 lines long; pedicels 6 to 7 lines long, becoming elongated in fruit; sepals ovate, 3 to 5-nerved; capsule globose, acute, 3 to 5 lines long, eventually dehiscent by 10 valves, the valves often with a brown midnerve.—Sierra Nevada, 4000 to 9000 ft., s. to San Diego Co.; rare in the Coast Ranges; n. to Brit. Am., e. to Texas.

2. **L. dígynum** Gray. Stem slender, simple below, corymbosely forked above, 4 to 9 in. high; leaves usually opposite, elliptic or oblong to spatulate-oblong, 3 to 10 lines long, the lower entire, the upper sharply serrate; flowers short-pediceled; sepals irregularly serrate or lacerate; petals yellow, not appendaged, 2 lines long; carpels 2, the false septa complete.—Meadows, 3500 to 4700 ft., Sierra Nevada from Mariposa Co. to Plumas Co. and n. to Siskiyou Co.; n. to Wash. June-July.

3. **L. adenophýllum** Gray. Stem simple below, repeatedly forked above and forming a widely branched panicle, 4 to 14 in. high; leaves alternate or the lowest opposite, lanceolate, 3 to 6 lines long, the margin conspicuously glandular-ciliate; flowers yellow or yellowish white, about 2 to 2½ lines long; sepals entire and naked, or slightly glandular-ciliate; appendages of the petals broad and confluent, somewhat pubescent; filaments abruptly dilated and 2-toothed at base; capsule as long as the lanceolate sepals.—Open hills, 3000 to 5000 ft., Lake and Mendocino Cos.

4. **L. drymárioides** Curran. Similar to no. 3; herbage sparingly villous; leaves broadly ovate; flowers pink, scattered; petals minute, 2-toothed and appendaged at base.—Foothills, w. Colusa Co.

5. **L. clevelándii** Greene. Stem branched above the base, repeatedly dichotomous, 8 to 12 in. high; herbage glabrate, leaves oblong to linear, 3 to 5 lines long; flowers on filiform pedicels (1 or) 2 to 7 lines long; petals

yellow, (¾ or) 1 to 1½ lines long, 2-toothed, 3-appendaged; capsule somewhat longer than the sepals.—Opens on chaparral slopes, 1000 to 2500 ft., Napa, Lake and Mendocino Cos., in the geographic gap of L. micranthum, between Mt. Tamalpais and Mt. Diablo on the south, and Hy-am-pum on the north. June.

6. **L. spergulinum** Gray. Fig. 581. Stems simple below, above more or less dichotomously paniculate, slightly hairy in the forks, 11 to 18 in. high; leaves linear, 3 to 6 lines long; pedicels filiform, rigid, straight, 3 to 10 lines long; flowers pinkish-white, 3 to 3½ lines long; sepals ovate, naked or with one edge weakly glandular-ciliate; petals 2-toothed, with 3 appendages, the middle one ligulate and hairy, the lateral horn-like, twined outward and downward, or often reduced; capsule ovoid, acute, nearly twice as long as the sepals.—Open or brushy slopes, 1000 to 2000 ft., Contra Costa and Sonoma Cos. to Mendocino Co. June-July.

581. Linum spergulinum Gray; *a*, fl. branchlet x ½; *b*, stamens x 5; *c*, pistil x 5; *d*, median gland or appendage at base of petal and two lateral horns x 7½.

7. **L. micránthum** Gray. Stems freely branched above the base, the branches commonly rather closely ascending, 5 to 10 in. high; leaves narrowly linear, 3 to 6 lines long; flowers white or pinkish, commonly 2 lines long, somewhat nodding on the curved ends of straight or nearly straight pedicels; pedicels 2 to 9 lines long; sepals oblong-lanceolate, the inner sparingly or microscopically glandular-ciliate; petals 1 to 1½ (rarely 2½) lines long, 2-toothed, with or mostly without appendages; capsule ovoid, equal to the sepals.—Open hills, often in rocky soil, 1900 to 4500 ft., San Diego Co. to Siskiyou Co. in both the Coast Ranges and Sierra Nevada; n. to Ore. May-July.

8. **L. califórnicum** Benth. Stem paniculately branched, with angled or striate branches, 4 to 24 in. high; herbage glaucous; leaves linear, 5 to 12 lines long, with prominent stipular glands; sepals lanceolate, glabrous but the 3 inner sparingly glandular-ciliate; petals white or pinkish, 2 to 3½ lines long, 3-appendaged, the median appendage rounded, not hairy; capsule ovoid, acute, a little shorter than the sepals.—Open hills, 1000 to 2000 ft.: San Carlos Range; Mt. Diablo; Napa Co.; Lake Co.; Butte Co. Var. CONGÉSTUM Jepson n. comb. Sepals puberulent.—Coastal: San Mateo Co.; San Francisco; Marin Co. (L. congestum Gray.)

9. **L. brèweri** Gray. Stems rather shortly branched at summit, or at least not diffusely branched, 9 to 14 in. high; herbage glaucous; leaves narrowly linear, 5 to 8 lines long; flowers bright yellow, 3 lines long; sepals ovate, some slightly glandular on the margin; petals obovate, 3 to 4 lines long, the short claw with a tooth on each side and a central gland.—Dry hill or cañon sides in grassy opens: Mt. Diablo; Vaca Mts. June.

OXALIDÀCEAE. OXALIS FAMILY

Ours low herbs with sour juice and palmately 3-foliolate leaves. Flowers complete, regular, symmetrical, 5-merous. Ovary superior, 5-celled; styles 5, distinct. Fruit a loculicidal capsule.

1. ÓXALIS L. Wood Sorrel

Leaflets obcordate, closing and drooping at night. Peduncles axillary, 1 to several-flowered. Sepals imbricated. Stamens 10, the filaments somewhat dilated and united at base. Glands none. Capsule membranous, 5-celled, more or less 5-lobed, the cells opening on the dorsal sutures through which the seeds are ejected, the valves remaining attached to the axis by the partitions. Seeds 2 to several in each cell. (Greek oxus, sour, the juice containing oxalic acid.)

Leaves alternate on the stem; flowers yellow.
Stems from a running rootstock; pedicels in fruit divergent or umbellate, bearing the capsules erect.....1. *O. corniculata.*
Stems from a stout caudex; pedicels deflexed or refracted in fruit, curved at tip and bearing the capsules erect.....2. *O. wrightii.*
Leaves all basal; flowers pink, white or rose-color.
Scapes commonly 1-flowered; petals 9 to 12 lines long.....3. *O. oregana.*
Scapes commonly 3 to 6-flowered; petals 3 to 6 lines long.....4. *O. trilliifolia.*

1. **O. córniculàta** L. Yellow Sorrel. Stems slender, decumbent or ascending, from running rootstocks, 3 to 6 in. long; herbage villous, sometimes very scantily so; leaflets ½ to 1¼ in. long, on slender petioles with small villous stipules; peduncles axillary, elongated, bearing 2 or 3 flowers; petals yellow; capsules linear, ½ in. long, many-seeded.—Weed introd. from Eur., mostly along the coast. Apr.-Oct. Var. ÁTROPURPÙREA Planch. Stems and foliage deep red-purple.—Native of Eur., garden escape.

2. **O. wrìghtii** Gray. Stems caespitose from a stout root-crown or short caudex, 3 to 7 (or 13) in. long; stems villous, the leaves pubescent; leaflets 3 to 5 lines long; peduncles axillary, elongated, 1 to 3-flowered; flowers 4 to 6 lines long; petals yellow, obovate, truncatish or usually emarginate; capsules oblong, ½ to ¾ in. long.—Monterey to San Diego, thence e. to Tex. Apr.-May. (Xanthoxalis californica Abrams.)

582. Oxalis oregana Nutt.; *a*, habit x ½; *b*, petal x 1; *c*, pistil x 2.

3. **O. orégana** Nutt. Redwood Sorrel. Fig. 582. Scapes and leaves from a creeping rootstock; herbage more or less rusty-villous; scapes 2-bracted near the top, commonly 1-flowered; leaflets broadly obcordate, broader than long, 1 to 1½ in. long; petals oblong-obovate, slightly retuse or obtuse, pink, white, or rose-color, often veined with purple, 9 to 12 lines long; capsules obovoid, 9 lines long.—Shady woods in the Redwood belt from the Santa Lucia Mts. to Del Norte Co.; n. to Wash. Mar.-Apr. Var. TRÀCYI Jepson n. var. Flowers small, 4 lines long; petals white, obtuse.—Humboldt Co. and n. to Curry Co., Ore. (Tamba Ranch, Chetco River, Jepson 9366, type).

4. **O. trílliifòlia** Hook. Scapes and leaves all basal from a fleshy-scaly rootstock; scapes as long as the leaves, 5 to 10 in. high, umbellately 3 to 6-flowered; leaflets thin, 1 to 1½ in. long; petals nearly white, deeply notched, 3 to 6 lines long; capsules linear, 10 to 15 lines long.—Montane, 5000 to 6000 ft.: Trinity Summit, n. Humboldt Co.; n. to Wash.

GERANIÀCEAE. Geranium Family

Ours herbs with lobed and divided leaves and scarious stipules. Flowers complete, regular, symmetrical, 5-merous. Sepals persistent. Petals deciduous. Stamens as many or twice as many as the petals. Ovary superior, 5-celled, deeply lobed, the 5 styles united around the elongated axis (prolongation of the receptacle) and free only at tip. Fruit of 5 one-seeded carpels separating elastically when ripe from the central persistent axis and bearing the twisted or spirally coiled styles as tails.

Stamens with anthers 10; leaves palmately parted; styles in fruit nearly glabrous inside.. 1. Geranium.
Stamens with anthers 5; leaves pinnatifid or pinnate, or roundish-cordate; styles in fruit bearded inside.....2. Erodium.

1. GERÀNIUM L. Cranesbill

Herbs with forking stems, swollen nodes and stipulate palmately parted leaves. Peduncles axillary, umbellately 2 or 3-flowered, or 1-flowered. Flowers regular, 5-merous, the sepals imbricate in the bud. Stamens 10, sometimes slightly connate at base, all with perfect anthers, the 5 longer alternate with the petals and with glands at their base. Styles in fruit nearly glabrous inside. Cotyledons plicate, incumbent on the caulicle. (Greek geranos, a crane, from the elongated fruit-bearing beak.)

Petals 1 to 2½ (or 3) lines long, little or not at all exceeding the calyx; stems leafy.
Carpels hairy; stems (especially the lower part) usually retrorsely pubescent.
Perennial; seeds superficially reticulate; pubescence glandless.....1. *G. pilosum.*
Annuals.
Inflorescence usually glandless; flowers light pink; leaf divisions broad; seeds reticulated.....2. *G. carolinianum.*
Inflorescence more or less glandular; flowers purple; leaf divisions narrow; seeds regularly pitted.....3. *G. dissectum.*
Carpels glabrous, transversely wrinkled; seeds smooth; stems and petioles pilose-spreading, the hairs sometimes glandular; annual.....4. *G. molle.*
Petals 4½ to 8 lines long, much exceeding the calyx; carpels and beaks glandular-pubescent; seeds very minutely roughened; perennials.
Leaves all basal; San Bernardino Mts.....5. *G. caespitosum.*
Stems leafy; widespread in the higher mts.
Petals pink; hairs of pedicels sometimes tipped with yellowish glands..... 6. *G. incisum.*
Petals white; hairs of pedicels tipped with purple glands....7. *G. richardsonii.*

1. **G. pilòsum** Forst. Stems slender, leafy, branching, arising from a thick root-crown, 1 to 1¾ ft. high; stems and petioles retrorsely hispidulose, the leaves hispidulose; leaves ¾ to 1 in. wide, incisely 3 or 5-parted, the cuneate segments more or less deeply toothed or cleft; peduncles 2-flowered; petals deep purple, 1 to 2 lines long; carpels dark brown or black, somewhat sparsely hairy.—Introduced from Eur.: Inverness, Marin Co.; Trinidad, Humboldt Co. May-June. Var. retrórsum Jepson n. comb. Pubescence of stem retrorsely strigose.—Presidio, San Francisco; Blue Lake, Humboldt Co. June. (G. retrorsum L'Her.)

G. sibíricum L. Annual; peduncles 1-flowered; sepals strongly awned; petals white, 3 lines long.—Native of Siberia; adv. at Olema, Marin Co.

2. **G. carolinìanum** L. Carolina Geranium. Stems branching, erect or ascending, 7 to 14 in. high; herbage pubescent; leaves palmately 5 to 7-parted, the cuneate segments more or less incisely dissected or toothed, the ultimate segments rather broad; peduncles commonly shorter than the petioles; inflorescence usually not glandular; flowers about 3 lines long; petals light pink; beak of fruit loosely villous, sometimes glandular; carpels hairy, usually black; seed reticulately ridged or pitted.—Nat. from eastern U. S.; widely distributed but mostly infrequent. Mar.-May. Var. lóngipes Wats. Branching from base, looser and more spreading; leaves cleft into 3 to 5 broader nearly equal primary lobes which are toothed or cleft; peduncles longer than the petioles, spreading.—Humboldt and Siskiyou Cos., 2500 to 3800 ft.; n. to B. C., e. to Col. July-Aug.

3. **G. disséctum** L. Common Geranium. Fig. 583. Differing little from no. 2, but the primary lobes of the leaves typically very narrow, with the ultimate divisions mostly slender, somewhat falcate and acute; petals rose-purple; inflorescence and fruit glandular.—Nat. from Eur.: Coast Ranges,

583. Geranium dissectum L.; *a*, fl. branchlet x ½; *b*, fl. x 1½; *c*, carpel x 1; *d*, seed x 5.

frequent in the San Francisco Bay region. Feb.-June.

4. **G. mólle** L. Stems slender, several from the base, 12 to 20 in. high; leaves pubescent, deeply cleft into 5 to 7 broad cuneate segments, the segments toothed or cleft, the basal leaves with petioles 3 to 5 in. long; pedicels widely divergent after flowering; petals rose-pink, cleft at apex, 1½ lines long, with a tuft of hairs at base; carpels glabrous, finely wrinkled transversely, the beak glandular-pubescent. — Introduced from Eur., infrequent: San Francisco; Hydesville, Humboldt Co.; Eureka; Gilbert Creek, Del Norte Co. May.

5. **G. caespitòsum** James. Peduncles scape-like, these and the leaves in a basal tuft from a thick caudex, 5 to 6 in. long; herbage puberulent, the peduncles and petioles retrorsely hairy; leaves 5-parted or -divided, the segments cuneate, deeply toothed or cleft; peduncles 1 or 2-flowered; petals pale, purple-veined, villous within, 4½ to 5 lines long.—San Bernardino Mts., 7000 to 8000 ft.; e. to N. Mex. June.

6. **G. incìsum** Nutt. Stems 1 to 2 ft. high, from a stout often branched caudex; herbage pubescent, the stems and pedicels pilose, the hairs sometimes tipped with yellow glands; basal leaves or petioles 6 to 11 in. long, deeply parted into usually 5 segments which are again cleft or deeply toothed; cauline leaves short-petioled, parted into usually 3 segments; petals pink or purple, hairy inside, 5 to 7 lines long.—Mountain valleys and cañon flats, 4000 to 7000 ft.: mts. of S. Cal.; Sierra Nevada from Tulare Co. to Siskiyou Co.; n. to B. C. June-Aug.

7. **G. richardsònii** F. & T. Fig. 584. Stems rather slender, from a stout caudex, 1½ to 2¼ ft. high; herbage appressed-pubescent, the stems and petioles pilose or hirsute, sometimes retrorsely so; basal leaves deeply 5-parted into toothed or cleft segments, the petioles 3 to 12 in. long; hairs of the pedicels tipped with purple glands; petals white, mostly roseate-veined, hairy within, 5 to 6 lines long.—Mountain valleys or along cañon bottoms, 5500 to 9000 ft.: mts. of S. Cal.; Sierra Nevada from Tulare Co. to Siskiyou Co., thence s. to Humboldt Co. (800 ft); e. to Rocky Mts., n. to Saskat. July.

584. Geranium richardsonii F. & T.; *a*, basal leaf x 2/9; *b*, fl. branchlet x ⅓; *c*, stamen circle and pistil x 1⅓; *d*, fruit x ⅔.

2. **ERÒDIUM** L'Her. STORKSBILL

Annual herbs. Leaves opposite, often unequal, either simple or pinnate, with one interpetiolar stipule on one side and two on the other. In vegetative characters very similar to Geranium; the flower and fruit nearly the same, but the stamens with anthers 5 only, the alternate filaments sterile and scale-like. Styles bearded inside. Pedicels after anthesis commonly retrocurved. (Greek erodios, a heron.)

Sepals not bristle-tipped; leaves mostly cordate or subcordate at base.
Leaves round-ovate to oblong-ovate, sub-palmately cleft or parted.....1. *E. texanum.*
Leaves cordate-reniform, crenately toothed or shallowly lobed....2. *E. macrophyllum.*
Sepals bristle-tipped or setose-tipped; leaves oblong or oblong-ovate, not cordate at base, pinnatifid or pinnately divided into toothed or cleft lobes.
Leaves pinnately cleft into broad crenate lobes; beak of fruit 3 to 5 in. long; sepals bristle-tipped; glands of the flowers greenish.....3. *E. botrys.*
Leaves pinnate; beak of fruit 1½ to 1¾ in. long; glands of the flowers reddish or brownish.
Leaflets serrate or merely incised; petals with naked claws; sepals without bristles or sometimes tipped with 1 or 2 short setose hairs; stipules large, obtuse.....4. *E. moschatum.*
Leaflets pinnatifid; petals with ciliate claws; sepals tipped with 1 or 2 long bristle-like hairs; stipules commonly small and acute..5. *E. cicutarium.*

1. **E. texànum** Gray. Stems caespitose, several from the base, leafy, 1½ to 11 in. long; herbage canescently appressed-pubescent, without glandular hairs; leaves round-ovate to oblong-ovate, cordate to subcordate at base, subpalmately lobed or divided, dentate, 4 to 11 lines long; flowers in clusters of about 3; sepals oblong, abruptly mucronate, silvery with appressed pubescence, purple-veined; petals purple, 7 to 9 lines long on the earliest flowers, the late ones greatly reduced or suppressed; carpels rather sparsely hairy, the beak scabrous, appressed-pubescent.—Sandy soils, Mohave and Colorado deserts; e. to Tex. Apr.-May.

585. E. botrys Bertol.; leaf x ¼.

2. **E. macrophýllum** H. & A. Peduncles and leaves basal or sub-basal, 3 to 12 in. high; herbage puberulent; leaves reniform-cordate, crenate and often shallowly lobed, 1 to 2 in. broad; umbels mostly 2 or 3-flowered; petals white, 5 to 8 lines long, little exceeding the broad sepals; filaments conspicuously orbicular-dilated at base; mature carpels densely silky-hairy, truncate at top, 4 lines long.—Great Valley; South Coast Ranges; coastal S. Cal.; rare. Var. CALIFÓRNICUM Jepson. Taller, branching, 12 to 16 in. high; herbage puberulent and also beset with gland-tipped hairs; leaves 2 to 3½ in. broad; umbels frequently 5 or 6-flowered; petals deep rose-red or purple.—Alameda Co. to Los Angeles Co.

3. **E. bótrys** Bertol. Fig. 585. Stems leafy, branching from the base, commonly prostrate, but sometimes erect, ½ to 2½ ft. long; herbage coarsely white-pubescent; leaves 1 to 4 in. long on petioles as long or twice as long, oblong-ovate, pinnatifid, the lobes serrate, acute; sepals short-pointed and tipped with 1 or 2 short bristles; petals deep violet; glands greenish; filaments dilated nearly to apex and toothed.—Mediterranean plant widely naturalized. On low pastured hills and rolling gravelly plains its rosettes of leaves are formed in winter or early spring, lie flat on the ground, kill out other seedlings and effectively protect the plant from close competition.

4. **E. moschàtum** L'Her. WHITE-STEM FILAREE. MUSK CLOVER. Fig. 586. Leaves at first forming a close rosette on the ground, later with stout fleshy ascending leafy stems ½ to 1½ ft. high; herbage hirsute with scattered spreading hairs; leaves 2 or 3 in. to 1½ ft. long; leaflets ovate to elliptical, serrate and sparsely incised, short-petiololate, ¾ to 1½ in. long, the terminal cuneately 3 to 5-parted; peduncles much elongated in fruit, 4 to 11 in. long; petals rose-purple, 3 lines long, with short claws; filaments membranously winged at base, with upwardly pointing

586. E. moschatum L'Her.; leaf x ¼.

587. E. cicutarium L'Her.; leaf x ¼.

teeth; beak of the fruit 1½ to 1¾ in. long.—Nat. from Eur.; abundant in rich lands of valley orchards and vineyards, in the North Coast Ranges often forming extensive pure growths and in such places far more common than E. cicutarium. Mar.-Apr. The term Filaree, a contraction of the Spanish Alfilerilla, is, like the names Pin Clover or Pin Grass, indifferently applied to either this species or to no. 5.

5. **E. cicutàrium** L'Her. RED-STEM FILAREE. Fig. 587. Leaves at first forming a close rosette on the ground, later with more or less ascending leafy stems 3 to 12 in. long; leaflets subsessile, nearly oblong, incisely pinnatifid with acute often toothed lobes; petals rose-purple; sepals terminated by 1 or 2 bristle-like hairs; filaments little dilated at base, not toothed, beak of the fruit 1 to 1¼ in. long.—Introduced from the Mediterranean region; barren hillsides or dry plains everywhere; in all interior or semi arid regions far more common than no. 4. Beginning to flower in Feb. or Mar. and in many places continuing through the summer. It is an esteemed forage plant. The stems are commonly reddish, in no. 4 commonly with white stems.

LIMNANTHÀCEAE. MEADOW FOAM FAMILY

Annual herbs with dissected alternate leaves without stipules. Flowers complete, regular, symmetrical, 3 to 6-merous. Calyx of distinct sepals, persistent, free from the ovary. Petals withering-persistent. Stamens twice as many as the petals. Carpels 5, their bodies distinct but with a common style arising from among them near the base, at length separating from a very short axis as 1-seeded nutlets.

Flowers commonly 5-merous, never 3-merous; petals notched at apex, longer than the sepals; cismontane ..... 1. LIMNANTHES.
Flowers 3-merous; petals entire, shorter than the sepals; northern Sierra Nevada, mostly transmontane ..... 2. FLOERKEA.

1. LIMNÁNTHES R. Br.

Flowers solitary on axillary peduncles, ours 5-merous (exceptionally 4 or 6-merous). Sepals valvate in the bud. Stamens 10, distinct, the filaments alternate the petals with a gland-like swelling at base. Petals with a U-shaped band of hairs on the claw. Stigmas 5, capitate. (Greek limne, marsh, and anthos, flower, in reference to the habitat.)

Nutlets smooth or with only a few tubercles at apex; corolla white, usually with a yellow eye; herbage glabrous ..... 1. *L. douglasii.*
Nutlets densely set with scale-like tubercles, the ridges or plates of the tubercles densely covered on the margins with very minute roundish granules, these granules microscopically scaly on the surface.
  Herbage glabrous; corolla white, commonly aging or fading pinkish ..... 2. *L. rosea.*
  Herbage (especially the young parts) pilose; corolla white, sometimes rose-tinted at apex ..... 3. *L. alba.*

1. **L. douglásii** R. Br. MEADOW FOAM. Stems several from the base, ascending, 6 to 14 in. long; herbage yellowish green, succulent, glabrous; leaves pinnately divided, the divisions 3 to 9 and incisely toothed or parted; peduncles at length 2 to 4 in. long; sepals lanceolate, 3 to 4 lines long, ½ the length of the petals; petals white (or occasionally roseate), yellowish at base or sometimes wholly white, obovate-cuneate, a U-shaped band of hairs on the claw; nutlets smooth to strongly tuberculate, about 2 lines in diameter. —Low ground in or near shallow water, forming large patches which color in Apr. the valley levels in the Coast Ranges from Trinity Co. to San Luis Obispo Co.; less common in the Sierra foothills from Butte Co. to Tulare Co.; rare in S. Cal. (San Diego Co.). Its white and yellow is nearly as pleasing as that of blue in Nemophila menziesii. (Floerkea douglasii Baill.)

2. **L. rósea** Hartw. VALLEY FOAM. Fig. 588. Stems more or less fleshy, many from the base, ascending or erect, 4 to 12 in. high; petals white, the nerves rose-color, commonly aging or fading rosy or with a tinge of rose, 6 to 7 lines long; nutlets grayish or light brown, densely set all over with rather thin spreading scale-like tubercles or crests, the ridges or plates of

the tubercles covered with very minute or microscopic roundish granules furnished with microscopic scales. — Sacramento Valley and lower San Joaquin Valley. Perhaps this passes into L. alba. (Floerkea rosea Greene.)

3. **L. álba** Hartw. Commonly erect, 5 to 8 in. high; young parts and buds more or less pilose, the calyx densely white-woolly with long hairs on the inside; sepals rather broad; petals white, often rose-tinted at apex; nutlets reddish brown, prominently tuberculate, the tubercles composed of plates or strands and thus more or less hollow or latticelike.—Northern Sierra foothills (Tuolumne Co. to Shasta Co.) and adjacent rolling plains. (Floerkea alba Greene.)

588. Limnanthes rosea Hartw.; *a*, habit x ½; *b*, fr. x ½; *c*, petal base x 1.

2. FLOÉRKEA Willd.

Similar to Limnanthes but the flowers 3-merous. Petals small, entire, shorter than the sepals, alternate with as many glands. Stamens 6. Stigmas 3, not capitate. (H. G. Floerke, a German botanist.)

1. **F. proserpinàcoìdes** Willd. Stems slender, (1½ or) 6 to 12 in. high; herbage glabrous; petals white, 1 line long; nutlets with somewhat slender tubercles at summit.—Mountain valleys, 5000 to 7500 ft., n. Sierra Nevada from Nevada Co. to Modoc Co.; n. to Ore., e. to Del.

POLYGALÀCEAE. Polygala Family

Perennial herbs or bushes with alternate simple leaves and no stipules. Flowers in terminal racemes, irregular and resembling the papilionaceous flowers of Leguminosae, but not like them in structure. Stamens (in ours) monadelphous. Ovary simple, superior.

1. POLÝGALA L. Milkwort

Stems often with milky juice. Sepals 5, thin, the two lower and the upper keeled one of about the same size, the two lateral much larger, colored, and projecting like the wings of a pea-flower. Petals 3, united at base, 2 forming a dorsal pair, the third anterior, hooded above and often beaked or crested, enclosing the stamens and style. Stamens 8, monadelphous, the tube open on one side and adnate to the base of the petals. Ovary 2-celled with one ovule in each cell; style long, curved. Capsule with thin walls, flattened contrary to the partition, rounded and often notched above, dehiscing loculicidally at the margin. Seeds with a conspicuous caruncle. (Polus, much, and gala, milk, an ancient Greek name for some shrub used as a stimulant.)

Spineless plants.
- Beak of the keel broad, strongly curved; flowers purple; sepals glabrous or essentially so; caruncle often wrinkled and bladdery, its lobes concealing the upper part of the seed like a cap; herbaceous; Coast Ranges ..... 1. *P. californica.*
- Beak of the keel slender, straight or nearly so; flowers greenish-white; sepals pubescent; caruncle almost as long as the seed, not cap-like, but with a short lobe projecting downward a little on each side of the seed; woody at base; Sierra Nevada mostly ..... 2. *P. cornuta.*

Spiny bush; desert region ..... 3. *P. acanthoclada.*

1. **P. califórnica** Nutt. Fig. 589. Stems many from the crown of a perennial root, mostly simple, 3 to 8 in. high; leaves oblong- or elliptic-ovate, ½ to 1½ in. long, distinctly petioled; flowers of two sorts: those near the root apetalous and developing most of the fruit; those of the terminal racemes with rose-purple corollas 5 to 6 lines long; capsules broadly elliptical, 3 lines long.—Wooded or brush-covered slopes: San Luis Obispo Co. to Marin Co.

589. Polygala californica Nutt.; *a*, fl. and fr. branchlets x ⅔; *b*, fl. x 2.

and the Napa Range; n. to Ore. Not reported from the inner Coast Range. May-June.

2. **P. cornùta** Kell. Stems several from the base, branching, woody below, 1 to 3 ft. high; leaves ovate to oblong or linear, ¾ to 1¼ (or 1¾) in. long, shortly petioled; flowers greenish-white, 4 lines long, borne in a short dense terminal raceme; outer sepals densely tomentulose; petals scarcely equaling the keel; capsule orbicular. — Sierra Nevada, 1500 to 3500 ft., from Fresno Co. to Siskiyou Co., thence s. to Humboldt Co. June-July. Var. FÍSHIAE Jepson n. comb. Bush 2 to 4 ft. high; outer sepals puberulent; wings purple; keel yellow.—Foothills and mts., coastal S. Cal.: Matilija Cañon, Ventura Co.; Mt. Wilson; Dulzura; s. to L. Cal. (P. fishiae Parry.)

3. **P. acanthóclada** Gray. DESERT POLYGALA. Spiny shrub 1 to 2½ ft. high; herbage ashy-pubescent; leaves oblanceolate to linear, 3 to 6 lines long; flowers white, 2 lines long; petals purplish-tinged at apex; wings notched at apex; capsules broadly elliptic, emarginate, 2½ lines long. —Providence Mts.; e. to Ariz. and Col.

EUPHORBIÀCEAE. SPURGE FAMILY

Herbs or shrubs. Leaves simple. Flowers monoecious or dioecious, in ours small or minute (1½ to 2 lines long), always apetalous in ours (except Argythamnia), often naked, i. e., destitute of calyx as well, sometimes exceedingly reduced and enclosed in a calyx-like involucre. Stamens 1 to many. Ovary superior, 3 (4 or 1)-celled, with one or two pendulous ovules in each cell. Styles or stigmas as many or twice as many as the cells of the ovary. Capsule commonly 3-lobed, 3-valved. Embryo straight, the flat cotyledons almost as wide as the fleshy or oily endosperm.

Staminate flowers with a calyx, the pistillate with or without a calyx, neither kind borne in an involucre.
- Ovary with 2 ovules in each cell; anthers erect in the bud; flowers pediceled, disposed in umbellate axillary clusters; shrubs.
  - Leaves alternate; capsule 3-celled ..... 1. SECURINEGA.
  - Leaves opposite; capsule 4-celled ..... 2. TETRACOCCUS.
- Ovary with 1 ovule in each cell; leaves alternate; shrubs or herbs.
  - Anthers in the bud bent inward and downward.
    - Ovary 1-celled; annual ..... 3. EREMOCARPUS.
    - Ovary 3-celled; perennial herbs or sometimes woody at base .... 4. CROTON.
  - Anthers erect in the bud.
    - Corolla present; flowers in much reduced axillary spikes or clusters; herbage mostly grayish or silvery ..... 5. ARGYTHAMNIA.
    - Corolla none; flowers in distinct spikes or racemes.
      - Herbage pubescent or canescent; leaves crenate or serrate, with stipules; shrubs.
        - Style very short or none; stigmas 3; leaves silvery-canescent beneath ..... 6. BERNARDIA.
        - Styles 3, filiform-dissected; leaves green-puberulent ..... 7. ACALYPHA.
      - Herbage glabrous; stipules none.
        - Leaves peltate; stamens many; styles 3, united at base; shrub ... 8. RICINUS.
        - Leaves ovate to linear; stamens 2; styles 3, distinct, simple; herbs. 9. STILLINGIA.

Flowers all without calyx, borne however in a calyx-like involucre and appearing like a single flower; leaves alternate or opposite ..... 10. EUPHORBIA.

1. SECURINEGA Comm.

Shrubs, ours with entire obovate small leaves. Flowers dioecious. Calyx imbricated. Staminate flower with a 5-lobed disk, the lobes alternate with the sepals; sepals 5 or 6, distinct; stamens in ours 6, surrounding a central

irregularly lobed disk; rudiment of pistil present, often 2 or 3-cleft. Pistillate flower with entire disk; ovary 3-celled, each cell 2-ovuled; styles 3, simple, united at base, stigmatic down the inside. Seeds in ours with a caruncle. (From Latin securis, an axe, in reference to the hardness of the wood.)

1. **S. fásciculàta** Jtn. var. **hállii** Jepson n. comb. Two to 6 ft. high, with rigid branches and spinescent branchlets; herbage subglabrous; leaves in fascicles, obovate, 2 to 3 lines long; sepals 6, minute; capsule globose-oblong, minutely and thinly pubescent, 3 lines long.—Cottonwood Sprs. and Chuckawalla Bench, Colorado Desert. (Tetracoccus hallii Bdg.)

2. TETRACÓCCUS Engelm.

Shrubs with entire linear leaves. Flowers reddish, small, dioecious. Staminate flowers in umbellate clusters of 1 to 5 on axillary pedicels shorter than the leaves; calyx 6 to 10-parted, with about 6 to 8 stamens surrounding a circle of reniform disk glands at their base. Pistillate flower solitary, pediceled; calyx similar to the staminate; ovary 4-celled, the cells with 2 ovules; styles 4, simple, distinct. Capsule 4-celled and 4-lobed, the valves separating from a stout 4-angled columella; seed usually solitary, strophiolate. (Greek tetra, 4, and coccus, fruit, referring to the 4-lobed capsule.)

1. **T. dióicus** Parry. Two to 5 ft. high, the branches rather slender; leaves opposite or some alternate, ½ to 1¼ in. long, very shortly petioled; staminate flower-clusters 3 to 5 lines long; staminate calyx ½ line long, the stamens much exserted and a little woolly at base.—San Diego Co.; s. to L. Cal.

3. EREMOCÁRPUS Benth.

A low gray annual with entire 3-nerved leaves. Staminate flowers pediceled in terminal corymbs; calyx 5 or 6-parted; stamens 6 or 7 on a hairy receptacle; filaments exserted. Pistillate flowers 1 to 3 in the lower axils, without calyx; ovary 1-celled, with 4 or 5 small glands at the base; style undivided, stigmatic at apex; capsule 2-valved, 1-seeded. (Greek eremos, solitary, and karpos, fruit.)

1. **E. setígerus** Benth. TURKEY MULLEIN. Fig. 590. Stems dichotomously branched, forming a prostrate mat 1 to 3 ft. wide or a low broad plant 5 to 8 in. high, or reduced to a dwarf 1 to 2 in. high; herbage stellate-pubescent and rough-hispid; leaves alternate or the upper opposite, thick, ovate, the smaller varying to almost orbicular, ⅛ to 2½ in. long, the petioles nearly as long or longer; ovary and style densely pubescent; capsule 2 lines long; seeds smooth and shining, 1½ lines long. — Dry open areas, low hills and valley plains, 10 to 4500 ft.; very abundant towards the interior, especially on broken ground, common throughout cismontane Cal.; n. to Wash. The California Indians used the heavy-scented herbage of this plant to stupefy fish in small streams in order that they might be caught by hand, whence the Spanish-Californian name, Yerba del Pescado. The seeds are sought by turkeys and by turtle-doves. (Piscaria setigera Piper.)

590. Eremocarpus setigerus Benth.; *a*, entire plant resting on the ground x 1/14; *b*, branchlet x ½; *c*, fl. x 3; *d*, ovary x 5; *e*, seed x 3½.

4. CRÒTON L.

Ours perennial herbs, the stems often woody at base. Leaves entire. Flowers monoecious, sometimes dioecious. Staminate flowers in racemes; calyx 5-divided; glands of the disk as many as and alternate with the petals; stamens 5 to many. Pistillate flowers mostly solitary; calyx 5-parted; ovary 3-celled, the cells 1-ovuled; styles twice forked. Capsule 3-lobed, globose in outline. Seeds smooth and shining, with a caruncle. (Kroton, a tick, the Greek name of the Castor Plant, its seeds resembling that insect.)

591. Croton californicus Mull. Arg.; *a*, fl. branchlet x ½; *b*, staminate fl. x 2; *c*, pistillate fl. x 2; *d*, fr. x 2.

1. **C. californicus** Mull. Arg. Fig. 591. Stems branching, erect or diffuse, 1 to 3 ft. long; herbage hoary or the leaves green above; leaves oblong to elliptic, ¾ to 1½ in. long, on petioles 3 to 8 lines long; staminate racemes at length 6 to 7 lines long, developing gradually, the flowers soon deciduous after anthesis and leaving an elongated naked rachis; staminate calyx about 1 line long; stamens 7 to 14, with hairy filaments; pistillate flowers on short pedicels; capsule scurfy, 3 to 4 lines broad.—Sandy hills near the ocean, washes and sandy mesas in the interior: San Francisco and Contra Costa Co. s. to coastal S. Cal., thence e. to the interior deserts. Var. MÀJOR Wats. Stouter and with large leaves 1½ to 3 in. long; staminate racemes denser, with larger flowers; pistillate flowers more numerous.—Santa Barbara Co. to San Diego Co. Var. TÉNUIS Ferg. Stems more slender; leaves narrowly oblong to lanceolate, ½ to 1 in. long, on short petioles 1 to 4 lines long; flowers dioecious; caruncle prominent, with a broad appressed lobed base.—Potrero, San Diego Co.; Ft. Mohave, Ariz. Var. LÓNGIPES Ferg. Stems much branched; leaves oval, 5 to 10 lines long, only slightly pubescent.—S. Cal. Var. MOHAVÉNSIS Ferg. Much branched, 1½ to 2¼ ft. high; leaves narrowly oblong, 3 to 10 lines long.—Mohave Desert.

5. ARGYTHÁMNIA P. Br.

Herbs or herb-like, the stems often woody below. Flowers usually monoecious, in very short or reduced axillary spikes or clusters consisting of about 2 to 5 flowers. Sepals 5, nearly distinct, hairy. Petals 5, straw-color, alternate with the calyx-lobes and with the lobes of the glandular disk. Glands 5, set between the petal claws. Stamens (in ours) 10 to 15, the filaments united into a central column, disposed in sets of 5, the third or upper whorl sterile. Anthers erect in the bud. Styles 3, once to thrice forked. Seeds shallowly pitted or reticulate. (Greek arguros, silver, and thamnos, bush, the species often hoary.)

Perennial, the stems arising from the branched crown of a woody root; sterile whorl of stamens stellate, i. e., reduced to 5 very short lobes stellately arranged.
Herbage silvery strigose; calyx pubescent outside, no dilation in the sinuses; capsule densely hairy.....1. *A. sericophylla.*
Herbage glabrous or nearly so; calyx glabrous, white-margined, with a small bulbous dilation or short blunt spur in each sinus; capsule glabrous.....
2. *A. californica.*
Annual; herbage appressed-hairy; sepals pubescent, ciliate with short gland-tipped bristles; sterile whorl of stamens consisting of 5 filaments; capsule densely hairy.....
3. *A. serrata.*

1. **A. sèricophýlla** Gray. Stems slender, much-branched at the nodes and inextricably interlaced, very brittle, somewhat woody below, 8 to 18 in. high; herbage silvery-strigose; leaves lanceolate to linear or oblong, acute, ½ to 1¼ in. long; sepals ovate to lanceolate; petals white, deltoid or ovate, abruptly short-clawed, hairy on the back; seeds gray with shallow circular pits and stellate markings.—Rocky cañons, Colorado Desert; e. to Ariz., s. to L. Cal.

2. **A. califórnica** Bdg. Stems several from a woody root-crown, 8 to 12 in. long; herbage glabrous; leaves obovate, serrulate, abruptly short-acute, mostly petioled, ¾ to 1½ in. long; sepals linear-lanceolate, serrulate, with a whitish margin; petals about as in no. 1; seeds brownish, reticulated with bead-like ridges, the intervals lineate.—Coachella, Colorado Desert.

3. **A. serràta** Mull. Arg. Stems several, 2 or 4 to 12 in. long; herbage strigose; leaves ovate to obovate, obscurely serrulate or entire, contracted to a more or less distinct petiole, ½ to 1 in. long; petals thin, whitish, purple-veined, narrow-ovate, acute or acuminate, often serrulate, gradually narrowed at base but not definitely clawed, glabrous or merely ciliate at apex; seed gray, reticulate, not lineate.—Colorado River Valley; Ariz. to L. Cal.

6. BERNÁRDIA P. Br.

Shrubs with alternate stipulate leaves. Flowers monoecious (in ours) or dioecious, in small spikes or racemes. Staminate flowers with 3 to 5-parted valvate calyx; stamens 3 to 20, distinct, on a central receptacle. Pistillate flowers with 6 (sometimes 3 or 9)-parted imbricate calyx; ovary 3-celled, 3-ovuled; stigmas nearly sessile, 2-lobed. Seeds without caruncle. (P. F. Bernard, 1749-1825, French botanist.)

1. **B. myricaefòlia** Wats. Stems many, erect, 3 to 7 ft. high, the herbage grayish with a fine but often dense stellate pubescence; leaves thick, ovate, serrate, prominently veined, ¼ to 1½ in. long; staminate flowers in axillary racemose clusters; stamens 5 to 7; pistillate flowers terminal, sessile; capsule globose, densely stellate-tomentulose, 5 to 7 lines in diameter; seeds subglobose, smooth, 3 to 4 lines long—S. Mohave Desert and w. Colorado Desert; s. to L. Cal. and Mex.

7. ACÁLYPHA L.

Herbs or shrubs with serrate stipulate leaves. Flowers monoecious, in catkin-like spikes. Staminate spikes small; calyx 4-parted, valvate; stamens 7 to 9, usually 8, distinct, on a raised central receptacle. Pistillate spikes short, or the pistillate flowers often solitary or few at the base of the staminate spikes; calyx shallowly 8-lobed; ovary 3-celled, 3-ovuled; styles 3, red, in ours filiform-dissected. Capsule often surrounded by the enlarged bract. (Greek akalyphes, a nettle.)

1. **A. califórnica** Benth. Low shrub; herbage puberulent, the leaves a little glandular; leaves ovate-cordate, 3 to 10 lines long, short-petioled; spikes peduncled, the staminate 4 to 10 lines long, about 1 line broad, the pistillate 2 to 3 lines long.—Dry hills, 1000 to 4500 ft., San Diego Co. (Poway, Jamul); s. to L. Cal.

8. RÍCINUS L.

Herb or shrub. Leaves large, peltate, palmately lobed. Flowers monoecious, in terminal racemes, the upper flowers pistillate, the lower staminate. Stamens many, the anthers erect in the bud; filaments much branched, each with many anthers. Styles 3, united at base, plumose, red. Capsule large, 3-lobed; seeds 3, with large caruncle. (Latin name, the seeds resembling ticks.)

1. **R. commùnis** L. Castor Bean. Shrub 3 to 8 ft. high; leaves 7 to 11-cleft, ½ to 1 (or 2) ft. broad.—Cult. from the tropics: locally naturalized in coastal S. Cal.

9. **STILLÍNGIA** Gard.

Glabrous herbs. Flowers monoecious, disposed in spikes which are pistillate at base. Bracts conspicuously biglandular, the glands trumpet-shaped or pedicellate saucer-shaped. Calyx imbricate in the bud. Staminate calyx thin or scarious, in ours 2-parted; stamens in ours 2; anthers erect in the bud. Pistillate calyx in ours none; ovary 3-celled, each cell 1-ovuled; styles 3, nearly distinct, simple. Capsule lobes breaking away from a 3-horned base. Seeds usually carunculate. (Benj. Stillingwell, 1702-1771, London student of the ancient Greek plants.)

Leaves narrowly linear, entire or nearly so; central column of capsule persistent; stems tall, rush-like.....1. *S. linearifolia.*
Leaves ovate, pectinately serrate; central column of capsule none; stems short, very leafy.
2. *S. annua.*

1. **S. lineàrifòlia** Wats. Rush-like perennial with a tuft of slender stems 3 ft. high; leaves narrowly linear-lanceolate, 1 to 1½ in. long; spikes mostly terminal.—Cismontane S. Cal. and Colorado Desert. Var. PÁUCIDENTÀTA Jepson n. comb. Leaves with 2 or 3 setaceous teeth on each side near the base; seeds slightly carunculate.—Mohave Desert, n. to Inyo Co. (Stillingia paucidentata Wats.)

2. **S. ánnua** Muell. Tufted annual or perennial, 3 to 6 in. high; leaves ovate, spinulose-serrate, acuminate, narrowed to a short petiole, 1 to 1½ in. long; spikes mostly axillary; glands at base of bracts somewhat trumpet-shaped.—Desert washes: Colorado and Mohave deserts.

10. **EUPHÓRBIA** L. SPURGE

Herbs or shrubs. Involucres solitary in the forks or disposed in terminal cymes, with 4 or 5 teeth or lobes alternating with glands borne in the sinuses; glands either naked or appendaged (that is, with a colored margin). Flowers monoecious, both pistillate and staminate naked and included in an involucre which itself resembles a flower but really encloses a cluster of flowers consisting of several staminate and 1 pistillate flower. Staminate flower very much reduced, consisting of a single stamen; filament jointed on a short pedicel like it, the pedicel often with a minute scale or bract at base, showing that the stamen is a distinct flower. Pistillate flower supported on a pedicel in the center of the involucre and soon protruded from it, consisting of a 3-celled ovary and 3 bifid styles. Capsule with 3 cells, each 1-seeded. (Euphorbus, King Juba's physician.)

A. STEM LEAVES OPPOSITE, OBLIQUE AT BASE; GLANDS 2 TO 4, USUALLY WITH A PETAL-LIKE WHITE OR REDDISH APPENDAGE (OR THIS LACKING IN NOS. 8, 9 AND 11).

1. Leaves serrate or serrulate; stipules distinct; annuals.

Plants erect or nearly so; herbage glabrous or slightly hairy; stipules triangular, entire or slightly lacerate; capsule obtusely angled.....1. *E. preslii.*
Plants prostrate.
Herbage glabrous; stem and leaves green or greenish, infrequently reddish; seeds clay-white.
Seeds smooth or irregularly rugulose.....2. *E. serpyllifolia.*
Seeds with 3 or 4 sharp transverse wrinkles on the sides....3. *E. glyptosperma.*
Herbage hairy or puberulent; leaves often reddish or red-spotted.
Appendages of glands toothed; leaves reddish or green, but not spotted.....
4. *E. hirtula.*
Appendages of glands entire; leaves often with a central red spot.5. *E. maculata.*

2. Leaves entire.

Annuals.
Herbage pubescent; leaves round-ovate to oblong; seeds oblong, acutely 4-angled; Colorado Desert.
Seeds slightly rugose transversely; herbage glandular-pubescent...6. *E. setiloba.*
Seeds with 4 deep transverse grooves; herbage cinereous-pubescent.....
7. *E. pediculifera.*
Herbage glabrous; leaves deltoid-ovate or oblong-ovate to elliptic; seeds more or less round-ovate.
Seeds broadly cylindric-ovate; glands entire, without appendages..8. *E. ocellata.*
Seeds round on back, flattish on face, very smooth; glands 2-toothed or horned on the outer margin.....9. *E. eremica.*
Perennials; leaves orbicular to round-ovate or oblong; seeds usually smooth.
Stipules united into a conspicuous membranous white triangular scale; glands orange or brownish.....10. *E. albomarginata.*
Stipules short-triangular to lanceolate, ciliate, minute; glands dark purple (sometimes yellow).....11. *E. polycarpa.*

B. Leaves mostly alternate, mostly not oblique at base; glands 5 or 4; plants never prostrate.

Glands of the involucre with a colored membranous appendage; pedicels of the flowers with a minute scale at base; leaves round-obovate, entire; shrub..12. *E. misera.*
Glands of the involucre without a colored appendage; herbs, the stems erect or ascending.
Leaves linear, entire or nearly so; involucres in terminal head-like clusters; stipules gland-like, minute; glands cup-shaped; annual or biennial..13. *E. eriantha.*
Leaves ovate, obovate or rotund, never linear; involucres in dichotomous or often umbellate cymes; stipules none.
Glands rounded and discoid, entire; capsule with warty lobes; leaves serrulate; annual.....14. *E. dictyosperma.*
Glands not entire, variously denticulate, lacerate, or horned; leaves entire.
Annuals (sometimes biennial).
Capsule smooth; stem leaves sessile or nearly so.....15. *E. crenulata.*
Capsule crested; stem leaves petiolate.....16. *E. peplus.*
Perennial; capsule smooth.
Glands rather longer than broad, 2-horned; leaves obtuse.....
17. *E. palmeri.*
Glands much broader than long, a little lacerate, not horned; leaves cuspidate.....18. *E. schizoloba.*

1. **E. préslii** Guss. Large Spurge. Stems simple below or branched from the base, erect or ascending, 9 to 14 in. high; herbage glabrous or scantily pilose; leaves broadly oblong, slightly cordate at base, serrulate, often reddish, or red-spotted, 5 to 12 lines long; stipules triangular, entire or somewhat lacerate; flowers in a small terminal panicle of cymes; involucres red-brown; glands small, their margins white or red, entire; capsule glabrous, obtusely angled; seeds brown, obtusely angled, with 2 or 3 broken transverse ridges.—N. Sierra Nevada foothills from Placer Co. to Butte Co., infrequent; e. to Atlantic. (E. hypericifolia Fl. W. Mid. Cal.; E. nutans Lag.)

2. **E. serpýllifòlia** Pers. Thyme-leaf Spurge. Fig. 592. Stems round, or more or less angled, repeatedly branched, forming prostrate mats 1 to 3 ft. across; herbage glabrous and green; leaves oblong-elliptic or obovate-spatulate, more or less minutely serrate toward the apex, 2 to 3 lines long; stipules setaceous or lacerate; involucre ½ line long or less; glands transversely oblong and more or less cupped in the center, the wing white, narrow, crenately serrate or nearly entire; seeds clay-white, sharply quadrangular, smoothish, rugulose or rugose-pitted. — Valleys and plains, 100 to 4000 ft., throughout Cal. Var. rugulòsa Engelm. Leaves more serrate on the larger side of the blade; seeds pitted.—San Bernardino.

592. Euphorbia serpyllifolia Pers.; *a*, habit x 1; *b*, involucre x 5; *c*, stamen x 12; *d*, seed x 5.

3. **E. glyptospérma** Engelm. Similar to no. 2; leaves oblong-linear; seeds with 3 or 4 sharp transverse ridges.—Adventive in S. Cal.; Ariz. and e.

4. **E. hírtula** Engelm. Stems prostrate or slightly ascending, 2 to 9 in. long; herbage villous; leaves elliptic-oblong, 1½ to 3 lines long; glands red, with a narrow white toothed appendage; capsules very small, acutely angled; seeds brown, acutely angled, shortly wrinkle-pitted or slightly wrinkled.—Pine belt of the mts., 3500 to 5500 ft.: Sierra Nevada from Mariposa Co. s.; San Jacinto Mts.; Cuyamaca Mts.; s. to L. Cal.

E. óccidentális Drew. Herbage dull yellowish-green, puberulent; seeds coarsely sinuate-rugose.—Hy-am-pum, Humboldt Co.

5. **E. maculàta** L. SPOTTED SPURGE. Stems radiately branching, prostrate, 3 to 10 in. long; herbage thinly soft-hairy; leaves oblong-elliptic to oblong-linear, usually with a red blotch in center, serrulate, subcordate at base; stipules setaceous, sometimes lacerate or fimbriate; glands 4, cup-shaped, with white entire margins; capsule acutely angled; seeds reddish or brown, transversely ridged.—Introd. from e. U. S.: Marysville; Berkeley; Ione; Pasadena; San Bernardino.

6. **E. setíloba** Engelm. Stems repeatedly dichotomous from the base, prostrate, 2 to 6 in. long; herbage reddish, softly glandular-pubescent; leaves round-obovate to elliptic, entire, 1 to 3 lines long, on slender petioles; stipules minute, low triangular; involucres solitary in the axils and in small leafy clusters terminating the branchlets, narrowly turbinate, the lobes ciliolate; glands erect, purple, the margins white or rose-color, narrow, fimbriate; capsules hairy, angled, ½ line long; seeds oblong, acutely 4-angled, slightly rugose transversely.—Sandy soil, Colorado River Valley from Riverside Mt. to Ft. Yuma.

7. **E. pédiculífera** Engelm. Stems pubescent throughout, slender, procumbent, much branched, 1 ft. long; herbage finely cinereous; leaves oblong to obovate, entire, moderately but distinctly unequal at base, 3 to 4½ lines long, on slender petioles; stipules very small, triangular; involucres clustered on short axillary branchlets; glands large, purple, the margins conspicuous, white, short-fanshaped, crenulate; styles bifid almost to the base, divaricate; capsule pubescent; seeds 4-angled with 4 straight and deep transverse grooves.—Colorado Desert (Carrizo Mt.); e. to Ariz., s. to Mex. Apr.

8. **E. ocellàta** D. & H. Stems many from the base, prostrate, 5 to 13 in. long; herbage glabrous; leaves deltoid to oblong-ovate, thickish, unequal at base, often cordate at base, entire, 2 to 5½ lines long; stipules subulate, mostly entire; involucres hemispheric, nearly 1 line long, the lobes fringed; glands 2 to 4, yellowish or purplish, short-stipitate, saucer-shaped, the appendages none or narrow; capsule 1 line long; seeds red-brown, round-ovate, smooth or slightly wrinkled.—Dry sandy valleys and foothills: inner South Coast Ranges; Great Valley; Sierra Nevada foothills; S. Cal.; e. to Nev. Var. ARENÍCOLA Jepson n. comb. Glands sessile; seeds clay-white.—Mohave Desert and n. (E. arenicola Parish.)

9. **E. erèmica** Jepson n. sp. Stems few or several from the base, prostrate, slightly glandular, 4 to 8 in. long; herbage yellowish-green, glabrous; leaves oblong-elliptic, obtuse, entire, 2 to 5 lines long; involucres turbinate-cylindric, the glands saucer-shaped with the margin produced outwards into 2 acute lobes or horns; capsules obtusely angled, 1½ lines long; seeds clay-white, round on the back, flattish on the face, very smooth.—Conchilla Desert (Jepson 6047, type).

10. **E. albomárginàta** T. & G. RATTLESNAKE WEED. Stems numerous from a woody base, prostrate or decumbent, 2 to 12 in. long; herbage glabrous; leaves nearly orbicular to round-ovate, 2 to 4 lines long, margined with a thin whitish edge, often retuse; stipules united into a conspicuous membranous white triangular scale, entire or slightly lacerate; involucres mostly solitary, nearly 1 line long; glands 4, orange or brownish, with conspicuous white or rose-color appendages; capsule nearly 1 line long, the lobes angled on the back; seeds oblong, 4-angled.—Plains and mesas, S. Cal.; e. to Tex., s. to Mex. May-June.

593. Euphorbia polycarpa Benth.; *a*, habit x ⅓; *b*, invol. x 3.

11. **E. polycárpa** Benth. Fig. 593. Stems numerous, ascending or prostrate from a woody root-crown, 2 to 11 in. long; herbage glabrous or somewhat finely pubescent, leaves round-ovate or ovate to oblong, slightly cordate at base or obtuse, obtuse or acutish at apex, 1 to 2½ lines long; stipules minute,

lanceolate to short-triangular, ciliate; involucres commonly solitary in the axils, turbinate-campanulate, ½ to ¾ line long; glands transversely oblong, red-purple (sometimes yellow), the appendages varying from conspicuous (broad, white or rose-color and somewhat crenulate) to none; capsules ¾ line long, puberulent, the lobes angled; seeds oblong, 4-angled, ½ line long. —Dry mesas and rocky slopes: San Diego Co.; Colorado Desert; Mohave Desert; Inyo Co.; e. to Tex. Var. VESTÌTA Wats. Hoary-pubescent.—Santa Monica; Glendora; Cahuenga Pass; Colorado Desert to Inyo Co.

12. **E. mísera** Benth. Much branched straggling shrub 2 to 3 ft. high; herbage minutely puberulent or glabrate; leaves round-obovate, obtuse or retuse, 2 to 5 lines long, exceeding the petioles; stipules present; involucres solitary, terminal on the short branchlets of the season, hemispheric, 1 line long, their lobes short, inflexed; glands purple, with a white crenulate appendage; capsules 2 to 2½ lines long, with rounded lobes, somewhat warty; seeds round-ovate, reticulate-wrinkled or slightly pitted.—San Diego; s. to L. Cal.

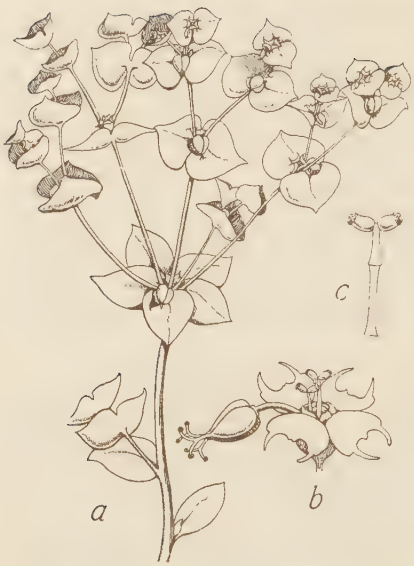
13. **E. eriántha** Benth. Stems one or several from the base, slender, 7 to 18 in. high; herbage glabrous or finely puberulent above; leaves distant, narrowly linear, attenuate to a short petiole, 1 to 2¼ in. long, the uppermost forming a whorl subtending the flower-cluster and many times exceeding the flowers; involucres in close clusters of 1 to 4 at the end of each branch, hoary-pubescent, campanulate, their lobes incurved, fimbriate with densely pubescent teeth; glands thin, the broad appendage fimbriate; styles undivided; capsule obtusely lobed, finely pubescent, 2 to 2½ lines long; seeds brown, quadrate-oblong, with low warty ridges; caruncle conspicuous.—Cañons and mesas among rocks, Colorado Desert: Eagle Mts.; Chuckawalla Bench; Andreas Cañon; Agua Caliente near Carrizo Creek; s. to L. Cal. and Mex., e. to Ariz. Apr.

E. LÁTHYRUS L. Caper Spurge. Stout annual or biennial 1 to 3 ft. high, very smooth and glaucous; stem-leaves linear or narrowly oblong, thick, in 4 vertical ranks, the floral oblong-ovate and cordate; umbels of 3 or 4 rays, once or twice forked; glands of the involucre crescent-shaped.—Mediterranean species, occasionally adventive: Myer's Ranch, South Fork Eel River; Berkeley; Seven Oaks, San Antonio Mts.

14. **E. dictyospérma** F. & M. Fig. 594. Stems erect, 5 to 15 in. high, simple or branching from the base, dichotomously branched above; herbage glabrous; lower leaves oblong- or obovate-spatulate, serrulate, often retuse, ½ to 1¼ in. long; upper and floral leaves opposite, round-ovate to oblong, 3 to 6 lines long; inflorescence umbelliform, the rays 2 or 3 times forked; involucre and glands small; glands not horned; capsule with warty lobes, 1 to 1¼ lines long.—Hill country, 100 to 3000 ft., throughout cismontane Cal. but infrequent; n. to Wash., e. to Neb. and Tex.

594. Euphorbia dictyosperma F. & M.; *a*, habit x ½; *b*, involucre x 6.

15. **E. crenulàta** Engelm. Fig. 595. Stems several from the base, erect, rarely decumbent at base, 6 to 16 in. high, 2 or 3 times dichotomous above; leaves obovate to spatulate, obtuse, sometimes mucronate, entire, sessile or the lower shortly petioled, 4 to 15 lines long, the floral opposite or ternate, deltoid or broadly rhombic-ovate, sometimes cordate at base or connate, apiculate, 3 to 5 lines long; involucre turbinate, its transversely oblong lobes denticulate; glands large, crescent-shaped, the slender horns entire or cleft; capsule smooth, 1½ lines



595. Euphorbia crenulata Engelm.; *a*, fl. branchlet x ½; *b*, invol. x 3; *c*, stamen x 5.

broad; seeds ash-colored, dark-pitted, 1 to 1½ lines long, with a prominent caruncle.—Common in the hill country throughout cismontane Cal.; n. to Ore.

16. **E. péplus** L. Petty Spurge. Stems simple or usually branched from the base, 4 to 7 in. high, umbellate above, the branches of the umbel dichotomous; herbage glabrous; leaves obovate or rotund, obtuse or retuse, 5 to 9 lines long, the slender petiole 2½ lines long; leaves of the umbel oblong or ovate, sessile; involucre about ½ line long, the triangular-ovate lobes ciliate with short thick hairs; glands with long spreading horns; capsule depressed-globose, the lobes with 2 crests on the back; seeds white, pitted, the caruncle conical.—Garden weed from Eur.: Berkeley; Monterey; San Bernardino.

17. **E. pálmeri** Engelm. Stems several from the woody root-crown, erect, ¾ to 1½ ft. high, umbelliferous above with 4 or 5 rays; herbage glabrous; leaves obovate, obtuse, shortly petiolate, 4 to 12 lines long, those of the inflorescence very broadly rhombic-ovate to subreniform, very obtuse, mostly apiculate; involucres 1 line long, the lobes rounded, entire, ciliate; glands shortly stipitate, crenate, somewhat 2-horned; capsule ovate, 2 lines long; seeds ovate, rugose, 1⅓ lines long.—Montane, 4000 to 6000 ft., Mt. Pinos and San Bernardino Mts. to Cuyamaca Mts.

18. **E. schizóloba** Engelm. Stems erect or decumbent at base, several from the root-crown, 6 to 16 in. high, at summit once to thrice dichotomous; herbage glabrous or slightly puberulent, somewhat glaucous; leaves ovate to obovate, cuspidate, 3 to 6 lines long, the floral ternate, round-ovate; involucre 1 line long, its lobes truncate, notched; glands stipitate, broad, irregularly toothed; styles united at base; capsule glabrous.—Desert ranges, 3000 to 4000 ft.: Panamint Mts.; Providence Mts.; e. to Nev. and Ariz.

CÁLLITRICHÀCEAE. Water Starwort Family

Herbs growing in shallow water or in the mud of drying vernal pools. Leaves opposite, entire, exstipulate, often crowded and forming a rosette at the ends of the branches. Flowers monoecious, axillary and solitary, or 2 or 3 together in one axil, without calyx or corolla but often with two membranous bracts. Staminate flower consisting of 1 terminal stamen. Pistillate flower consisting of a 4-celled ovary with 2 filiform stigmas. Fruit 4-lobed, splitting at maturity into as many nutlets.

1. CALLÍTRICHE L.

The only genus. (Greek kallos, beautiful, and trichos, a hair, on account of the slender stems.)

Fruit pediceled; flowers bractless; leaves not notched at apex; annual; mainly terrestrial. 1. *C. marginata.*
Fruit sessile; submerged leaves notched at apex.
Flowers 2-bracted; emersed leaves rosulate, round-obovate.....2. *C. palustris.*
Flowers bractless; leaves linear, all submerged.....3. *C. autumnalis.*

1. **C. marginàta** Torr. Stems 2 to 4 in. long, forming dense mats in former pool beds; leaves oblanceolate, 2 to 3 lines long; plants sometimes

submersed and the leaves linear or the upper floating ones spatulate; bracts none; styles long, reflexed, soon deciduous; fruit rather broader than long, notched both at apex and base, ⅓ to ½ line long, the lobes sharply winged or margined by a thin edge; fruiting pedicels 2 to 5 lines long, sometimes 2 from the same axil.—Coast Ranges from Humboldt and Solano Cos. to Los Angeles Co. Var. LÓNGIPEDÚNCULÀTA Jepson n. comb. Fruiting pedicels 1 to 3 in each axil, 5 to 12 lines long.—W. San Diego Co. (C. longipedunculata Mor.)

2. **C. palústris** L. WATER FENNEL. Aquatic; stems 5 to 10 in. long; submerged leaves linear-subulate, 1-nerved, notched at the apex, 7 to 10 lines long; emersed or floating leaves roundish-obovate, 1½ to 2 lines long, abruptly narrowed at base into a slender winged petiole, 1½ to 2 times as long; fruit roundish elliptic, flattened, slightly notched at apex, ½ to 1 line long, each lobe sharply margined on the back for its whole length, the proximate lobes with a groove between them.—Cold pools or slow streamlets: Coast Ranges from Santa Clara Co. to Humboldt Co.; n. Sierra Nevada foothills; n. to B. C., thence e. to the Atlantic. Mar.-May. Var. STENOCÁRPA Jepson n. comb. Leaves oblong-spatulate, all submerged.—Lassen Co. to Siskiyou Co. (C. stenocarpa Hegelm.)

3. **C. autumnàlis** L. Stems 4 to 6 in. long, submerged; leaves linear, 3 to 4 lines long, deep clear green, 1-nerved, retuse or bifid at the apex; bracts none; fruit sessile, roundish, notched, ½ to 1 line long, margined; styles long, reflexed, caducous.—Rare or local, Santa Clara and Sierra Cos.; n. to Ore., thence e. to Quebec; Eur., Asia.

ZÝGOPHYLLÀCEAE. CALTROPS FAMILY

Herbs or shrubs, ours with opposite pinnate leaves, interposed stipules and entire leaflets. Flowers perfect, regular, symmetrical or nearly so. Sepals 5, distinct or nearly so. Petals in ours 5. Stamens 10, inserted with the petals on the receptacle. Ovary usually of as many carpels as petals (rarely twice as many or fewer), its cells as many as the carpels or twice as many; style one; stigma barely lobed.

Herbs; leaflets 4 or more pairs; fruits usually spiny; seed without endosperm . . . 1. TRIBULUS.
Woody plants; leaflets few; seed with endosperm; fruits not spiny.
  Leaflets 3; flowers rose-purple; fruit nearly smooth, glabrous . . . . . 2. FAGONIA.
  Leaflets 2; flowers yellow; fruit densely hairy . . . . . 3. LARREA

1. TRÍBULUS Tourn. CALTROPS

Herbs, ours annuals, with even-pinnate leaves and several pairs of leaflets. Flowers yellow, solitary on the peduncles. Stamens opposite the sepals with a gland behind the filament at very base. Disk annular, 10-lobed. Ovary 5-celled; cells 3 to 5-ovuled. Fruit lobed, splitting into 5 nutlets; nutlets hard, indehiscent, usually muricate or spinescent on back. (Greek tribulos, ancient name of Trapa.)

1. **T. terréstris** L. PUNCTURE WEED. Branching from the base, the stems decumbent, ½ to 3 ft. long; herbage whitish-pubescent; leaflets 4 to 7 pairs, oblong, 3 to 4 lines long; flowers on short axillary peduncles; petals 1 to 2 lines long; ovary 5 (or 4)-celled, in fruit splitting into as many 1 to 3-seeded nutlets and having no central axis; nutlets warty on back and with 2 stout spreading spines 2 to 3 lines long; seeds superposed, separated by transverse partitions.—Native of Eur., becoming naturalized near railway stations, thence spreading as a serious pest in alfalfa fields and becoming a nuisance in waste lands and along roadways: Riverside; Colton; Bakersfield; Los Banos; Tracy; Antioch; Willows; Castle Crags sta.

2. FAGÒNIA Tourn.

Suffrutescent plants, ours with 3-foliolate leaves. Flowers rose-purple. Petals clawed, early deciduous. Ovary 5-celled, a pair of collateral ovules in each cell. Fruit deeply 5-lobed, smooth, breaking up into 5 distinct carpels which separate from the persistent axis; carpels 1-seeded, dehiscent ventrally. (G. C. Fagon, French botanist, 17th century.)

1. **F. californica** Benth. Erect, slender, very much branched and thickly interlaced, ¼ to 2 ft. high; stems scabrous on the angles; stipules acerose, 1 to 3 lines long; leaflets lanceolate to obovate, cuspidate, 2 to 3 lines long, the lateral ones about equaling the petiole; flowers in cymes; petals crimson, obovate, obtuse, shallowly cupped on the upper side, clawed, spreading almost rotately, 2 to 4 lines long; fruit 2 lines long, much shorter than the deflexed peduncles.—W. side of the Colorado Desert: Coyote Cañon; San Felipe; Vallecito; Mountain Sprs.; Split Mt.; s. to L. Cal. Var. BARCLAYANA Benth. Stems granulose-glandular, not scabrous; leaflets rhomboidal, 3 to 7 lines long.—Colorado Desert (Grapevine Cañon); s. to L. Cal.

3. LÁRREA Cav.

Evergreen rank-smelling and copiously resinous shrubs. Leaves as if divergently 2-lobed, really consisting of 2 leaflets sessile on the short rachis by a broad base. Flowers yellow, terminal and solitary on the numerous short lateral branchlets. Sepals deciduous. Petals clawed, gnawed at base. Stamens on a small 10-lobed disk, the filaments with a laciniate-toothed scale at base on the inside. Ovary 5-celled, the cells about 6-ovuled; style slender with 5 stigmas. Fruit globose, densely white-hirsute, the 5 carpels at length separating from the axis as indehiscent 1-seeded parts. (J. A. de Larrea, Spanish promoter of science.)

596. Larrea tridentata var. glutinosa Jepson; *a*, fl. branchlet x ½; *b*, fl. x 1; *c*, fr. x 2.

1. **L. tridentàta** (DC.) Cov. var. **glutinòsa** Jepson n. comb. CREOSOTE BUSH. Fig. 596. Dark-green shrub, 2 to 5 ft. high, the branches ringed with a black-glandular band at the nodes and the leaves very resinous; leaflets oblong, somewhat curved, 2 to 5 lines long; petals twisted half round so as to resemble a turbine wind-mill, 3 to 4 lines long; fruit 2½ lines long, beaked by the style.—Very abundant in desert valleys and mesas in the Mohave and Colorado deserts; n. to Inyo Co.; e. to Tex., s. to Mex. Also called Greasewood. (Covillea glutinosa Rydb.)

RUTÀCEAE. RUE FAMILY

Ours shrubs or small trees, with glandular-dotted or aromatic leaves. Flowers regular and symmetrical, or nearly symmetrical. Sepals and petals 4 or 5. Stamens (in ours) as many or twice as many, inserted on or outside of a hypogynous disk. Ovary superior, seated on this disk or its base encircled by it. Style 1.

Leaves simple.
Fruit a deeply 2-lobed capsule; leaves alternate.....1. THAMNOSMA.
Fruit globose, drupe-like; leaves opposite.....2. CNEORIDIUM.
Leaves compound; fruit a circular samara.....3. PTELEA.

1. THAMNÒSMA Torr. & Frem.

Switch-like shrubs. Leaves alternate, small, narrow, soon deciduous. Flowers on scaly peduncles, the peduncles very short or sometimes almost none, solitary and terminal or scattered along the branchlets. Calyx short, 4-lobed, persistent. Petals 4, erect, scarcely spreading in anthesis. Stamens 8, equally

inserted with the petals on a narrow hypogynous disk. Ovary stipitate, 2-celled, didymous, with several ovules in each cell; style one; stigma capitate. Fruit a coriaceous strongly 2-lobed capsule; cells few-seeded. (Greek thamnos, a bush, and osme, odor.)

1. **T. montàna** Torr. & Frem. TURPENTINE BROOM. Fig. 597. Stems freely branching broom-like, yellowish green, 1 to 1½ ft. high, thickly covered with pustulate glands; herbage heavily odorous; leaves oblanceolate, 2 to 6 lines long; flowers 4 lines long, black-purple; petals ovate to elliptic, revolute at tip; stamens 4 long and 4 short; style slightly exserted; ovules 8 or 9 in each cell; capsule 5 lines broad, deeply parted into two subglobose lobes; lobes splitting dorsally from the apex, 1 to 3-seeded.—Dry or stony hills in the desert region: Colorado and Mohave deserts; Inyo Co.; e. to Utah and Ariz.

597. Thamnosma montana Torr. & Frem.; *a*, fr. branchlet x ⅔; *b*, fl. branchlet x ⅔.

2. **CNEORÍDIUM** Hook. f.

Low glabrous shrub with narrow opposite entire leaves. Flowers 1 to 3 on short peduncles. Calyx short, 4-parted. Petals 4, white. Stamens 8, the ones opposite the petals much shorter; filaments dilated. Ovary globose, 1-celled, 2-ovuled, seated on an annular disk; style short, flattened, lateral (arising from near the base of the ovary); stigma capitate. Fruit globose, drupe-like, 1 to 2-seeded. Seed globose, with curved embryo; endosperm fleshy. (Resembling Cneorum, an Old World genus.)

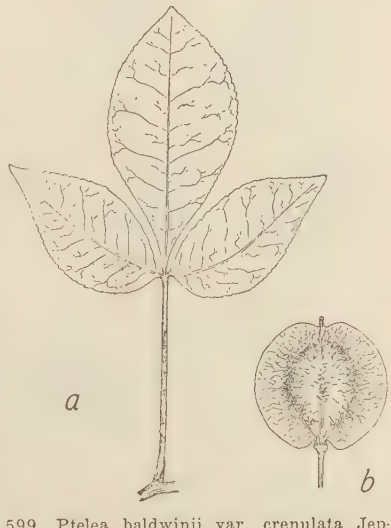
598. Cneoridium dumosum Hook.; fr. branchlet x 2.

1. **C. dumòsum** Hook. f. Fig. 598. Much branched bush, 2 to 3½ ft. high, the herbage heavily odorous; leaves linear or tapering to base, glandular-dotted, ½ to 1⅛ in. long, 1½ to 2 lines wide; peduncles solitary or clustered, 1 to 3-flowered; flowers 3 lines broad; petals obovate or elliptic; fruit reddish brown, resinous-punctate, 3 lines in diameter.—Hills and mesas, w. San Diego Co. (Witch Creek to Bernardo, Encinitas and San Diego); s. to L. Cal. Mar.-Apr. Pistils or carpels rarely two and then the fruit geminate.

3. **PTÈLEA** L.

Shrubs or small trees. Leaves alternate, pinnately trifoliolate with sessile leaflets. Flowers polygamous or dioecious, small, greenish white, in axillary paniculate cymes. Sepals, petals and stamens 4 or 5. Ovary 2-celled; cells 2-ovuled, the lower ovule abortive; style short; stigmas 2. Fruit a 2-celled 2-seeded samara, winged all around, broadly orbicular. (Greek name of the Elm, the fruit of which is similar.)

1. **P. baldwínii** T. & G. var. **crenulàta** Jepson. HOP TREE. Fig. 599. Small tree 8 to 15 ft. high; herbage glabrous or slightly pubescent; leaflets elliptic, obovate or elongated-rhomboidal, rounded or acute at apex, often with abruptly cuneate base,



599. Ptelea baldwinii var. crenulata Jepson; *a*, leaf x ½; *b*, fr. x 1.

crenulate or almost entire, 1 to 2¾ in. long; sepals very small; petals 2 to 2½ lines long; stamens hairy towards the base; fruit straw-yellow, 5 to 8 lines long, a trifle broader, tipped by the persistent style.—Cañons and flats in the foothills: inner Coast Range from Shasta Co. to Contra Costa Co.; Sierra Nevada foothills from Tehama Co. to Calaveras Co. Apr.-May.

SIMARUBÀCEAE. Quassia Family

Shrubs or trees similar to Rutaceae, but the leaves without dots and the wood and bark very bitter. Leaves alternate. Flowers perfect or unisexual, regular. Sepals and petals 3 to 5. Disk prominent, 10-lobed; stamens 6 to 10. Carpels mostly 2 to 5 (in ours 1 to 10), distinct or united, superior. Fruit in ours drupe-like or forming a samara.

Leaves large, odd-pinnate; fruit a samara.....1. AILANTHUS.
Leaves reduced to scales; fruit drupaceous.....2. HOLACANTHA.

1. AILÁNTHUS Desf.

Large trees. Leaves odd-pinnate. Flowers small, in large terminal panicles, polygamous, the staminate very ill-scented. Fruit of 1 to 5 distinct oblong samaras, with the compressed seed in the middle. (Ailanto, a Malakka name, meaning Tree of Heaven.)

1. **A. glandulosa** Desf. Tree of Heaven. Tree 20 to 60 ft. high; leaves 1½ to 2 ft. long; leaflets with 2 to 4 teeth near the base, the teeth with a gland beneath; samaras 1½ in. long.—Introduced from China and escaped from cultivation: Sierra Nevada foothills (San Andreas, Angels Camp, Columbia); Berkeley; Petaluma; Vacaville; Pleasant Valley, ne. Solano Co. It is the only exotic tree in California which is markedly spontaneous. It has in some localities become a pest as a tree weed.

2. HOLACÁNTHA Gray

Very thorny shrubs with rigid branches. Leaves reduced to small deciduous scales. Flowers dioecious, glomerate on the branched thorns. Calyx 5 to 8-parted. Petals 7 or 8. Staminate flowers: stamens 12 to 16, the filaments hairy at base. Pistillate flowers: stamens 6 to 8, the anthers imperfect; pistils 5 to 10, lightly connivent. Drupes small, dry, ovoid. (Greek holos, complete, and akantha, thorn, all the branchlets thorn-like.)

600. Holacantha emoryi Gray; *a*, fr. branchlet x ½; *b*, staminate fl. (after Bot. Mex. Bound. pl. 8) circa x 4; *c*, pistils x 3.

1. **H. emóryi** Gray. Crucifixion Thorn. Fig. 600. Five to 8 ft. high; fruiting clusters very dense, 1 to 2 in. long; drupes soon dry and nut-like, 2½ to 3 lines long.—Desert region: lava bed ne. of Daggett, Mohave Desert; "Hayfields," Chuckawalla Mts.; e. to southern Ariz.

BUXÀCEAE. Box Family

Evergreen shrubs with leathery simple leaves and unisexual apetalous flowers. Calyx of 5 (4 to 6) sepals. Ovary superior, 2 or 3-celled; styles 2 or 3; ovules 1 or 2 in each cell.

1. SIMMÓNDSIA Nutt.

Leaves opposite, entire. Flowers on short axillary peduncles, the pistillate solitary, the staminate in a capitate cluster; sepals distinct, somewhat un-

equal. Stamens 10 to 12. Styles 3; ovary 3-celled, becoming by abortion a 1-celled 1-seeded 3-valved fruit. (The naturalist, T. W. Simmonds.)

1. **S. californica** Nutt. JAJOBA. GOAT-NUT. Fig. 601. Rigid much-branched shrub 2 to 4 or 7 ft. high; leaves minutely, but the branchlets, peduncles and calyx obviously pubescent; peduncles 1 to 3 lines (rarely 1 in.) long; leaves oblong to ovate, 1 to 1½ in. long, barely petioled; staminate flower 1½ to 2 lines long, its sepals broadly oblong or subspatulate; pistillate flower much larger than the staminate, 6 lines long, its sepals ovate or lanceolate and often abruptly contracted above the roundish base; capsule short-cylindric, short-pointed, somewhat acorn-like, rather less than 1 in. long.—Arid hills: Chuckawalla Mts.; Conchilla Mts.; San Jacinto Mts.; San Diego Co.; e. to Ariz., s. to Mex.

601. Simmondsia californica Nutt.; *a*, staminate fl. branchlet x ½; *b*, pistillate fl. branchlet x ½; *c*, staminate fl. x 2½; *d*, pistillate fl. x 2½; *e*, cross sect. of ovary x 2½; *f*, nut x ½.

BURSERÀCEAE. TORCHWOOD FAMILY

Trees or shrubs with alternate pinnate leaves. Calyx 3 to 5-lobed, persistent, its base lined with a disk. Petals 3 to 5, the stamens twice as many as the petals, both borne under the disk. Ovary superior, 2 to 5-celled, each cell 2-ovuled; style 1. Fruit drupaceous but dry, 1 to 5-celled, indehiscent, or the epicarp splitting into valves and falling away. Seed solitary. Endosperm none.

1. BÚRSERA Jacq.

Flowers polygamous. Ovary 3-celled. Fruit 3-angled, 3-valved, in ours by abortion 1-celled and 1-seeded. (J. Burser, a botanist of the 16th century.)

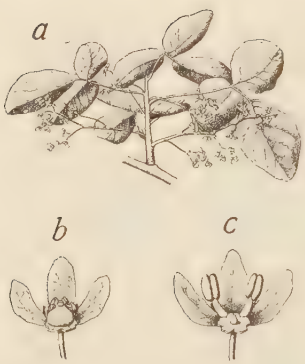
1. **B. microphýlla** Gray. ELEPHANT TREE. Low round-headed tree with very thick stems and branches, 4 to 10 ft. high; trunk diameter ½ to 2 ft.; herbage glabrous; leaflets 13 to 25, linear-oblong, 2 to 3 lines long; flowers 5-merous.—Rocky banks of washes: between Fish Creek and Carrizo Creek, sw. Colorado Desert; Ariz. to L. Cal. and Sonora. (Elaphrium microphyllum Rose.)

ANACÁRDIÀCEAE. SUMAC FAMILY

Trees or shrubs with resinous or milky acrid juice and alternate leaves. Flowers very small, regular, either perfect or polygamous. Calyx commonly 5-parted, a glandular ring or cup-like disk lining its base. Petals commonly 5, the stamens as many or twice as many. Ovary free from the calyx and from the disk, 1-celled, 1-ovuled; styles 3. Fruit a dry berry-like drupe; seed without endosperm.

1. RHÚS L. SUMAC

Shrubs or small trees. Leaves (in ours) simple or 3-foliolate. Stamens 5. Drupe flattened, with rather thin and dry flesh. (Ancient name.)



602. Rhus diversiloba T. & G.; *a*, fl. branchlet x ¼; *b*, pistillate fl. x 3; *c*, staminate fl. x 3.

Leaves 3-foliolate; deciduous shrubs; throughout Cal.
Flowers greenish, in panicles; drupe whitish, the stone rough.....1. *R. diversiloba.*
Flowers yellowish, in spikes; drupe red, the stone smooth.....2. *R. trilobata.*
Leaves simple, leathery; evergreen shrubs; flowers in panicles; S. Cal.
Panicle much branched, with slender divisions, glabrous or nearly so; drupe whitish...
3. *R. laurina.*
Panicle composed of stout spikes, finely pubescent; drupe red.
Leaves elliptic, rounded at apex.....
4. *R. integrifolia.*
Leaves ovate, acute or acuminate.....
5. *R. ovata.*

1. **R. diversíloba** T. & G. POISON OAK. Fig. 602. Erect shrub 4 to 8 ft. high, or the stems climbing tree trunks by adventitious rootlets; leaflets variable, roundish to ovate, variously lobed or toothed; panicles axillary, appearing with the leaves, somewhat pendulous; flesh of the whitish drupe marked with black fibres. — Foothills, valley streams, mountain slopes and mountain valleys, 50 to 5000 ft., widely distributed and often abundant: coastal S. Cal.; Coast Ranges; Great Valley (along rivers); Sierra Nevada foothills; n. to Ore. As a skin irritant the plant juice is highly poisonous, although some persons have immunity. The poison is a non-volatile oil and one may be poisoned only by actual contact or through clothing or other objects which have been in contact with the bushes, or through smoke particles. It is more widely spread in California than any other shrub. Bees make honey from the flowers; the honey contains no poison.

603. Rhus trilobata Nutt.; leaf x ½.

604. Rhus laurina Nutt.; leaf x ½.

2. **R. trilobàta** Nutt. SQUAW BUSH. Fig. 603. Diffusely branching, 2 to 3½ ft. high; leaflets broadly ovate or elliptic, cuneate at base, crenate or lobed; flowers pale yellow, appearing before the leaves, borne in terminal often clustered spikes; drupe viscidly pilose. — Narrow valleys or flats in cañon bottoms, 100 to 4000 ft., throughout Cal.; n. to Ore., e. to Rocky Mts. The slender but tough pliable branchlets were prized in basket-making by the native tribes. Var. ÁNISOPHÝLLA Jepson n. comb. Leaves small, the lateral leaflets unequal; berries bright crimson.— Desert region from the Cottonwood Mts. to the Panamint Mts. (Schmaltzia anisophylla Greene.)

3. **R. laurina** Nutt. LAUREL-SUMAC. Fig. 604. Very leafy shrub, 5 to 7 (or 13) ft. high, exhaling an aromatic odor; leaves ovate or lanceolate, abruptly mucronate, 1½ to 5 in. long; panicle dense; flowers ½ to 1 line long; drupe whitish, very small.—S. Cal. valleys near the sea. In San Diego Co. it is esteemed as a bee-food shrub.

4. **R. integrifòlia** B. & W. LEMONADE-BERRY. Fig. 605. Shrub 2 to 12 ft. high; leaves entire or with a few small sharp teeth, 1 to 2½ in. long; panicles ashy-puberulent; flowers 2 to 3 lines long; bracts, sepals and petals ciliolate.—S. Cal., near the coast, often forming thickets. The excretion on the surface of the berry is used for an acid drink.

605. Rhus integrifolia B. & W.; leaf x ½.

5. **R. ovàta** Wats. Sugar-Bush. Fig. 606. Similar to no. 4; leaves shining; panicle dull-puberulent or glabrate. —Dry hills, montane S. Cal., back from the coast. The sweetish waxen covering of the berries is used by the native tribes for sugar.

606. Rhus ovata Wats.; leaf x ½.

KOEBERLINIÀCEAE. Koeberlin Family

Trees or shrubs. Leaves minute or scale-like, alternate, early deciduous. Flowers in ours 5-merous, the stamens as many as the petals or twice as many. Ovary superior, seated on a short fleshy stipe or base; placentae axial.

1. CANÒTIA Torr.

Leafless shrub or small tree with slender spinose branchlets. Flowers white in small axillary racemes. Pedicels bracted and jointed above the base. Sepals, stamens and petals 5. Ovary 5-celled; style 1; stigma 1. Capsule woody, septicidally 5-valved, the valves 2-cleft. Seeds solitary in each cell, winged. (The Mexican name.)

1. **C. holacántha** Torr. Eight to 18 ft. high; flowers 2 lines long; capsule oblong, beaked, 9 to 12 lines long, the seeds half as long.—Providence Mts.; e. to Ariz.

CELASTRÀCEAE. Burning Bush Family

Shrubs with angled branches and simple leaves. Flowers small, perfect in ours, regular or a little irregular, 4 or 5 (or 6)-merous with jointed pedicels. Calyx deeply parted, persistent. Petals inserted under the free margin of a very thick and conspicuous disk which fills the saucer-like base of the calyx. Stamens commonly 4, 5 or 10, inserted on the disk. Ovary 2 to 5-celled, immersed in or surrounded by the disk; styles united into one, in ours short or none; stigma 3 to 5-lobed. Fruit a capsule or follicle, free from the calyx. Seeds with an aril; embryo large; endosperm fleshy.

Leaves opposite; petals red or purplish, roundish; fruit a capsule; unarmed shrubs; mostly cismontane.
Large erect shrubs; leaves petioled; seed completely enclosed in a fleshy red aril... 1. Euonymus.
Small prostrate shrubs; leaves subsessile; seed with a whitish aril at base..... 2. Pachystima.
Leaves alternate; petals white or greenish white, narrow; fruit a follicle; seed with a white aril at base; branches spinescent; deserts.....3. Glossopetalon.

1. EUÓNYMUS L. Burning Bush

Large shrubs. Leaves opposite, petioled, deciduous (in ours), with minute stipules or none. Flowers purplish, in few-flowered cymes on axillary peduncles. Calyx-lobes, petals and stamens 5 (rarely 6 or 4). Stamens inserted on the 5-lobed disk. Ovary 3 to 5-celled, the cells 2 to 6-ovuled. Capsule 3 to 5-lobed, the cells usually 1-seeded. Seeds covered with a fleshy red aril. (Greek eu, good, and onoma, a name.)

1. **E. occidentàlis** Nutt. Western Burning Bush. Fig. 607. Erect shrub (or sometimes a small tree) with slender often straggling branches, 6 to 18 ft. high, the greenish branchlets 4-angled; leaves glabrous, thin, ovate or often broadest above the middle and abruptly acuminate, serrulate, 1½ to 4 in. long, on petioles

607. Euonymus occidentalis Nutt.; *a*, fl. branchlet x ½; *b*, fl. x 2.

3 to 7 lines long; peduncles 1 to 2½ in. long, 1 to 5-flowered; flowers 4 to 5 lines broad; petals roundish, brownish-purple, finely dotted and with scarious margins; capsule depressed, smooth, deeply 3-lobed.—Redwood region from the Santa Cruz Mts. to Marin and Humboldt Cos.; Plumas Co.; Washoe Co., Nev.; n. to Wash. May-June. Var. PARÍSHII Jepson n. comb. Bark whitish; peduncles 3 to 6-flowered.—S. Cal. mts., 5000 to 6000 ft.: Mt. San Jacinto; Palomar; Cuyamaca Mts. (E. parishii Trel.)

2. **PACHYSTÌMA** Raf. MOUNTAIN LOVER

Low evergreen shrubs with squarish twigs and opposite coriaceous leaves with minute deciduous stipules. Flowers small, perfect, solitary or in few-flowered axillary cymes shorter than the leaves. Calyx-lobes, petals and stamens 4. Stamens inserted on the edge of the rounded disk. Ovary 2-celled, each cell with 2 ovules. Capsule not lobed, 1 to 2-seeded. Seed with a pale lacerate aril at base. (Greek pachus, thick, and stima, stigma.)

608. Pachystima myrsinites Raf.; *a*, fl. branchlet x ½; *b*, fl. x 4.

1. **P. myrsinites** Raf. OREGON BOX-WOOD. Fig. 608. Densely branched, very leafy, 1 to 3 ft. high, or sometimes nearly prostrate and rising about 6 in. from ground; leaves ovate to obovate or spatulate, ½ to 1 (or 1½) in. long, serrulate above the base, subsessile; peduncles about 1 line long, 1 to 3-flowered; flowers red-brown, 1½ to 2 lines wide.—Montane, 4000 to 5000 ft.: Butte Co. to Siskiyou Co.; n. to B. C., e. to Rocky Mts. May-July.

3. **GLOSSOPÉTALON** Gray

Deciduous shrubs with slender spinescent branches. Leaves small, alternate, entire, with minute stipules. Flowers 4 to 6-merous, one at each axil, borne on a slender pedicel. Calyx parted into unequal lobes. Petals narrow-oblanceolate, much longer than the calyx. Stamens mostly 5 to 10, inserted under the edge of the crenately 8 or 10-lobed disk. Ovary 1-celled, with 2 ovules; stigma sessile. Follicle obliquely ovoid, finely striate, 1 or 2-seeded, splitting down the ventral suture. Seed with a small thin white aril. (Greek glossa, tongue, and petalon, petal, because of the shape of the corolla parts.)

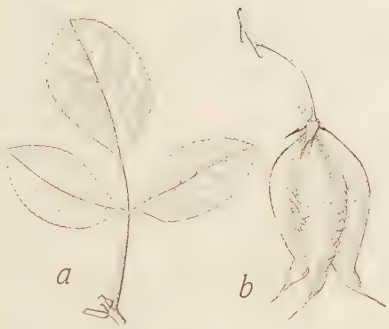
1. **G. spinéscens** Gray. Intricately branched, 1 or 2 ft. high; leaves oblong or obovate, glaucous, glabrous or nearly so, 2 or 3 lines long, narrowed to a very short but slender petiole with a broad base, with awl-like reddish stipules; pedicels shorter than the leaves; flowers 1 to 2 lines long; calyx-lobes and petals usually 5, sometimes 4; stamens 6 to 10, rarely 5 or 4; pod 2 lines long, containing 1 or 2 brown seeds.—Mohave Desert (Cushenbury Sprs.; Providence Mts.) and n. to White Mts. and Mt. Laura; e. Ore. to Nev., Tex. and n. Mex. Apr. (G. nevadense Gray.)

STAPHYLEÀCEAE. BLADDER-NUT FAMILY

Shrubs or small trees. Leaves opposite, pinnately compound, with 3 to several leaflets, usually with minute often caducous stipules and stipels. Flowers regular, perfect. Calyx-lobes and petals 5. Stamens 5, inserted outside a large disk. Ovary superior, 3-celled. Fruit a capsule, thin, opening at apex. Seeds very hard, with shining testa; endosperm present.

1. **STAPHYLÈA** L. Bladder-nut

Shrubs. Flowers white, in drooping raceme-like clusters terminating the branchlets. Calyx deeply 5-parted, the lobes erect, whitish. Petals erect. Ovary consisting of 3 carpels united in the axis, their long styles lightly cohering. Capsule large, inflated, bladder-like, 3-celled, the cells 1 to 4-seeded. (Greek staphule, a cluster.)



609. Staphylea bolanderi Gray; *a*, leaf x ½; *b*, capsule x ½.

1. **S. bolánderi** Gray. Sierra Bladder-nut. Fig. 609. Glabrous shrub 6 to 10 ft. high, or a slender tree up to 20 ft. high; leaflets 3, roundish ovate, acute, finely serrate, 1½ to 2½ in. long; pedicels ¾ to 1 in. long; sepals several-nerved, a little shorter than the petals; petals 6 lines long, with broad claws as long or longer than the elliptic blade; style and stamens much exserted; bladder 3-horned, 1¼ to 2 in. long.— Foothills, 2300 to 4500 ft., not common; Sierra Nevada from Tulare Co. to Siskiyou Co.

ACERÀCEAE. Maple Family

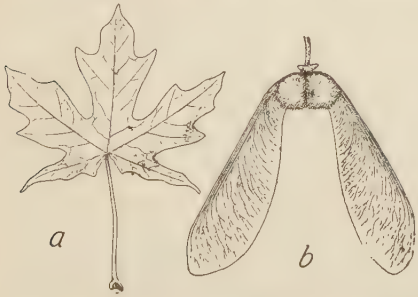
Deciduous trees or shrubs with opposite leaves. Flowers regular, polygamous or dioecious, borne in racemes, corymbs or fascicles. Calyx generally cleft into 5 segments, the petals as many or none. Stamens 3 to 10, borne on the edge of a disk or hypogynous. Pistil 1 with a 2-lobed 2-celled ovary and 2 styles. Ovary superior, developing a long wing from the summit of each lobe and thus ripening into a double samara; samaras separable at maturity, the wings serving to rotate them rapidly in the air and further their horizontal flight when carried away by the wind.

1. ÀCER L. Maple

Leaves simple or pinnate. Flowers small, the clusters always drooping. (Latin name of the Maple tree.)

Leaves simple; petals present.
Flowers in racemes; samaras more or less hispid; leaves large, deeply 5-lobed..... 1. *A. macrophyllum.*
Flowers in corymbs; samaras glabrous.
Leaves shallowly but acutely 7 to 9-lobed; sepals nearly twice as long as the petals.....2. *A. circinatum.*
Leaves mostly 3-lobed or -parted; sepals equaling petals.....3. *A. glabrum.*
Leaves pinnately or ternately compound; flowers dioecious; petals none...4. *A. negundo.*

1. **A. macrophýllum** Pursh. Big-leaf Maple. Fig. 610. Broad-crowned tree 30 to 95 ft. high; leaves roundish in outline, palmately parted into 5 broad fingers, 4 to 10 in. broad; perfect and staminate flowers mixed in the same raceme; stamens 7 to 9, villous below; body of samara short-bristly. — Along living streams throughout cismontane Cal., and also on east and north slopes of mt. ranges in the areas of about 25 to 50 inches rainfall; n. to B. C. and Alas. Also called Water Maple, White Maple and Oregon Maple.



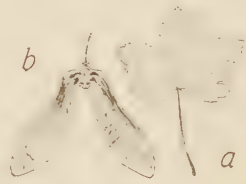
610. Acer macrophyllum Pursh; *a*, leaf x ⅛; *b*, fr. x ½.

2. **A. circinàtum** Pursh. Vine Maple. Fig. 611. Shrub or sometimes a small tree, erect and 5 to 20 ft. high, but more often vine-like or reclining; leaves 2 to 4 in. broad, 5 to 7-lobed to the middle,

611. Acer circinatum Pursh; *a*, leaf x ¼; *b*, fr. x ½.

with toothed margin; flowers 4 to 10 or more in a corymb, most of them staminate, the cluster often setting but one fruit; stamens 6 to 10, shorter than the petals in the perfect flower but longer than the petals in the staminate flower; filaments villous below; samaras glabrous, the wings spreading at right angles to the stalk, scarlet when full grown; as the fruit ripens, the peduncle turns upward and finally the samara stands erect above the leaf.—Along the coast from Humboldt Co. to Del Norte Co.; n. to B. C.

3. **A. glàbrum** Torr. Sierra Maple. Fig. 612. Shrub 5 to 10 ft. high, with slender branchlets; leaves 1 to 3 in. broad, palmately 3-lobed or often with 2 supplementary lobes at base, the margin unequally serrate; flowers 4 to 9, in loose umbel-like corymbs, the staminate without rudiments of pistils and the pistillate with short stamens; corymbs unisexual or with both pistillate and staminate flowers, the sexes often borne on different shrubs; stamens 7 to 10, glabrous; samaras usually several in a cluster, glabrous, the wings ascending.—Rocky or wet mountain sides, 6000 to 8000 ft.: San Jacinto Mts.; San Bernardino Mts.; Sierra Nevada; Salmon Mts. to Siskiyou Mts.; n. to Alas., e. to Rocky Mts.



612. Acer glabrum Torr.; *a*, leaf x ¼; *b*, fr. x ½.

4. **A. negúndo** L. var. **californícum** Sarg. Box Elder. Fig. 613. Tree 20 to 60 ft. high; leaves pinnately 3-foliolate, the leaflets 1¼ to 5 in. long, serrate and incised, or deeply 2 or 3-lobed, or the lobes sometimes becoming distinct and petioled so that one or more of the primary leaflets is replaced by 2 or 3; staminate flowers clustered on thread-like hairy pedicels, the stamens 4 or 5; pistillate flowers borne in slender racemes; samaras straw-white, crimson when young, finely pubescent.—Along streams and in low moist valley bottoms: Great Valley; Coast Ranges; s. to the San Bernardino Mts.

613. Acer negundo var. californicum Sarg.; *a*, leaf x ¼; *b*, fr. x ½.

SAPINDÀCEAE. Buckeye Family

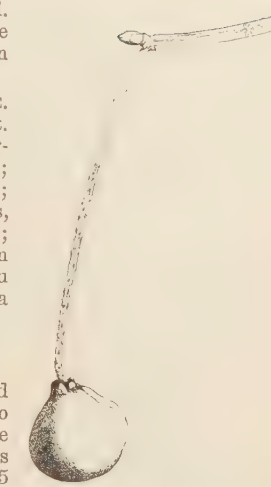
Deciduous trees or shrubs with opposite palmately compound leaves and slightly irregular flowers. Ovary superior, 3-celled with 2 ovules in each cell, commonly but one ovule maturing.

1. AÉSCULUS L. Horse Chestnut

Flowers showy, ill-scented, on jointed pedicels in a terminal cylindrical thyrse, of two sorts, perfect (fertile) with long thick styles and sterile with short styles; fertile flowers few near top of thyrse. Calyx tubular, unequally 5-cleft. Petals 4 or 5, slightly unequal, clawed. Stamens 5 to 7, becoming

successively much exserted and often unequal. Fruit a large 3-valved capsule releasing one large polished seed. (Latin name of an Italian oak with edible acorns.)

1. **A. californica** (Spach) Nutt. BUCKEYE. Fig. 614. Low broad-headed tree 10 to 20 ft. high; leaflets 5 to 7, oblong-lanceolate to oblong-elliptic, acute or acuminate, 3 to 5 in. long; thyrse 4 to 6 in. long; petals 6 to 7 lines long; axis of the thyrse at length naked and pendulous, bearing one pear-like pod or sometimes 2 to 9; seed 1 to 2 in. in diameter.—Dry hills or cañon sides, 10 to 4000 ft.: Coast Ranges from Siskiyou Co. to Antelope Valley, Los Angeles Co.; Sierra Nevada foothills. June.



614. Aesculus californica Nutt.; fr. branchlet x ¼.

RHAMNÀCEAE. BUCKTHORN FAMILY

Shrubs or small trees with simple leaves and mostly caducous stipules. Flowers small (½ to 1½ lines long), regular, commonly in little umbels, the umbels often aggregated in racemes or panicles. Calyx-lobes, petals and stamens 5 (or 4). Calyx-tube lined with a disk, the petals and stamens inserted on the edge of the disk and alternate with the calyx-lobes. Petals hooded, commonly clawed, sometimes wanting. Ovary 3 (or 2)-celled, free from or adnate by the disk to the base of the calyx; ovules 1 in each cell, or 1 or 2 in Condalia. Style simple or 3-cleft. Fruit in ours a berry-like drupe or a capsule.

Fruit drupe-like; calyx-lobes, stamens and petals 4 or 5; calyx or its lower portion persistent as a collar beneath the fruit.
  Drupe with 1 nutlet; petals clawed or none; calyx-lobes deciduous or persistent.... 1. CONDALIA.
  Drupe berry-like with 2 or 3 nutlets; petals clawless or none; calyx-tube circumscissile near middle, the upper portion of tube and lobes deciduous as one piece, the lower portion persistent.....2. RHAMNUS.
Fruit a capsule; calyx-lobes, petals and stamens 5; petals clawed.
  Calyx-tube joined to base of ovary, its lobes deciduous in fruit; style not jointed.... 3. CEANOTHUS.
  Calyx free from ovary, its lobes persistent in fruit; style jointed.....4. ADOLPHIA.

1. CONDÀLIA Cav.

Ours shrubs with divaricate mostly spiny twigs. Leaves alternate, entire, with minute stipules. Flowers in small axillary umbels, sometimes reduced to a single flower, sometimes developed into small panicles. Calyx deeply 5-lobed. Petals present or none. Ovary free from the calyx and annular disk, incompletely 2-celled, with 1 or 2 placentae and 1 or 2 ovules. Fruit drupaceous, the style-base persisting. (A. Condal, Spanish physician.)

Petals present; calyx deciduous; ovary with 2 placentae.
  Umbels or panicles peduncled; branches and spines puberulent.....1. *C. lycioides.*
  Umbels sessile; branches and spines glabrous.....2. *C. parryi.*
Petals none; calyx persistent; ovary with 1 placenta.....3. *C. spathulata.*

1. **C. lycioides** Weberb. Straggly branching shrub 4 to 6 ft. high, the branches regularly armed with rigid slender often leafless spines ¾ to 2¼ in. long; branches and spines whitened and puberulent, the flower-bearing branchlets and the calyces finely tomentose; shrub commonly leafless, the leaves when present narrowly elliptic, 4 to 7 lines long, very shortly petioled; flowers minute (about 1 line broad); drupe subglobose or somewhat elongated, 4 lines long.—Colorado Desert: Mammoth Tank; Cottonwood Sprs.; Purple Hills Pass, Colorado River.

2. **C. párryi** (Torr.) Weberb. Glabrous shrub 6 to 10 ft. high with flexuous branches and slender spines; branches and spines grayish or reddish-brown; leaves mostly fascicled on short spurs, obovate to elliptical, 4 to 8 lines long, shortly petioled on petioles 1 to 3 lines long; drupe elliptic to oblong, 6 to 7

lines long, shortly beaked, borne on a slender pedicel 4 to 5 lines long.—Western side of Colorado Desert: Morongo Cañon; Piñon Well, Conchilla Range; Palm Cañon; Grapevine Cañon; s. into L. Cal.

3. **C. spathulàta** Gray. Shrub, intricately branched, the branchlets rigid, spinescent, leafy; herbage puberulent; leaves obovate or spatulate, 2 to 3 lines long, narrowed to short petioles, the under side with a few broad light-colored veins in relief; umbels sessile, 1 or 2-flowered; pedicels 1 line long; drupe ovoid, 2 lines long.—Colorado Desert (Mesquite sta.); e. to Tex., s. to Mex.

2. RHÁMNUS L. Buckthorn

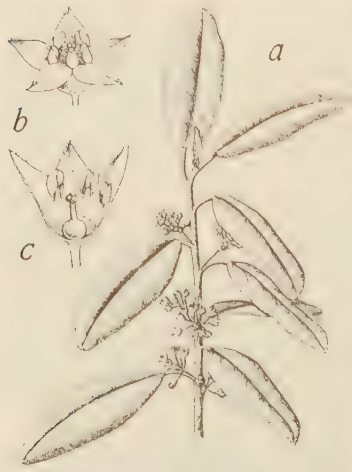
Shrubs with alternate leaves. Flowers greenish, perfect or polygamous. Umbels axillary, sessile or peduncled. Calyx with 4 or 5 lobes or teeth, its tube after anthesis circumscissile near the middle, the upper portion of tube and the lobes deciduous as one piece, the lower portion persistent as a narrow collar beneath the fruit. Petals very small, hooded and without claws, or none. Stamens 4 or 5; filaments short. Ovary ovoid, free. Fruit berry-like, containing 2 or 3 separate seed-like nutlets of bony or cartilaginous texture. (The ancient Greek name.)

Petals present; berry black.
- Foliage deciduous; leaves thinnish, 3 to 8 in. long.....1. *R. purshiana.*
- Foliage evergreen; leaves ¾ to 3 in. long.
  - Leaves thinnish; bark of branchlets cherry-red; petals when spread out somewhat rhomboidal, notched at apex, truncatish at base.....2. *R. rubra.*
  - Leaves thickish; bark of branchlets gray or brown; petals when spread out somewhat obcordate, sub-acute at base.....3. *R. californica.*

Petals none or very minute; foliage evergreen; berry red.....4. *R. crocea.*

1. **R. purshiàna** DC. Cascara Sagrada. Small tree or shrub 8 to 20 ft. high; leaves in a tuft at end of branchlets, thinnish, deciduous, elliptic-oblong, obtuse or slightly cordate at base, obtuse or abruptly blunt-pointed at apex, serrulate, 2½ to 5 (or 8) in. long; petioles tomentulous; flowers 5-merous; berry black, with 3 (rarely 2) nutlets.—Mountain slopes and cañons, Mendocino and Humboldt Cos. near the coast; n. to Wash. Var. ANÒNAEFÒLIA Jepson n. comb. Leaves obovate or oblong, the larger 4 to 7 in. long and 1¼ to 2½ in. wide, mostly cuneately tapering at base.—Bear Valley, Nevada Co., to Mt. Shasta. (*R. anonaefolia* Greene.)

2. **R. rùbra** Greene. Shrub 2 to 4 ft. high, with reddish twigs; leaves oblong, finely serrulate, glabrous, ¾ to 1½ in. long; umbels sessile or nearly so; berries obovoid or somewhat contracted at base, 2 to 3 lines long.—Sierra Nevada, 5000 to 7000 ft., from Mariposa Co. to Siskiyou Co.



615. Rhamnus californica Esch.; *a*, fl. branchlet x ⅓; *b*, fl. x 5⅓; *c*, long. sect. of fl. x 6.

3. **R. californica** Esch. Coffee Berry. Fig. 615. Shrub commonly 4 to 6 ft. high; leaves scattered along the branchlets, narrowly or broadly oblong, serrulate, usually acute, glabrous or slightly puberulent, dark green when dried, 1½ to 2½ in. long; flowers mostly 5-merous; peduncles 1 to 10 lines long; berry green when young, turning red or reddish and finally black when ripe, globose or oval, 3 to 4 lines in diameter, containing 2 (rarely 3) nutlets.—Cañons, hill and mountain slopes, 10 to 4000 ft.: Coast Ranges from Mendocino Co. to San Luis Obispo Co. and s. to the San Gabriel and San Bernardino mountains. June-July; fr. Sept.-Oct. Also called Pigeon Berry and Yerba del Oso. Very variable in foliage, various climatic areas having developed fairly distinctive leaf forms.

Var. TOMENTÉLLA B. & W. Leaves 2 to 3 in. long, elongated, oblong, varying to elliptic, obscurely serrulate or entire, abruptly acute or acuminate, usually conspicuously feather-veined, finely tomentose on the under side or even silvery, typically very olive-like; peduncles ½ to 1¼ in. long.—Dry foothills, 500 to 5000 ft.: Sierra Nevada foothills; inner North Coast Ranges; Santa Cruz Mts. and Mt. Hamilton Range; s. to S. Cal. mts. (San Bernardino, San Jacinto, Palomar and Cuyamaca Mts.); L. Cal. Var. VIRÍDULA Jepson n. var. Leaves obovate or oblong, obtuse or very shortly acute, ¾ to 1¼ in. long, dark green above, velvety beneath to the touch but scarcely to the eye; umbels sessile or shortly peduncled.—Desert slopes, Inyo Co. (Cottonwood Creek, 7500 ft., Jepson 5086, type). Var. OBTUSÍSSIMA Jepson n. comb. Leaves elliptic or broadly oblong, very obtuse, serrulate, 1 to 1½ in. long, often puberulent beneath, slightly yellowish when dried; umbels disposed to be sessile.—Sierra Nevada, 3500 to 5500 ft., n. to Mt. Shasta, s. to Mt. San Jacinto. (R. obtusissima Greene.) Var. CRASSIFÒLIA Jepson n. var. Shrub 3 to 8 ft. high; branchlets and petioles very stout; leaves oval or elliptic, obtusish at apex, or sometimes shortly acute, rounded or obscurely cordate at base, very thick and leathery, very prominently parallel-nerved beneath, 1½ to 3 in. long, 1 to nearly 2 in. wide, finely tomentulose below, microscopically so above; leaf-scars prominent.—Inner North Coast Range foothills from Colusa Co. (ridge w. of Bear Valley, Jepson 8974, type) to Tehama Co., in the chaparral. Var. OCCIDENTÀLIS Jepson n. comb. Foliage yellowish; leaves oval or elliptic, obtuse or shortly acute, entire, 1½ to 2½ in. long, glabrous; peduncles 1 to 6 lines long.—Three Creeks, n. Humboldt Co., Cal., to Josephine Co., Ore. Well-marked local form. (R. occidentalis Howell).

616. Rhamnus crocea var. ilicifolia Greene; fr. branchlet x 1.

4. **R. crocea** Nutt. RED-BERRY. Low densely branched glabrous shrub ½ to 2 or 3 ft. high, the branchlets rigid or even spinescent; leaves often fascicled, elliptic, firm coriaceous, 1 to 5 (or 8) lines long, serrulate, green above, yellowish beneath, very shortly petioled; flowers mostly polygamous and 4-merous; petals none or minute; berry 2 to 3 lines long, red, containing 2 (rarely 3) nutlets.—Napa Range and s. near the coast to Santa Barbara and San Diego. Feb.-May; fr. Sept. Var. ILICIFÒLIA Greene. Fig. 616. Tree-like with a distinct trunk, or the stems several and clustered, 3 to 12 ft. high; branchlets rather stout, repeatedly and shortly branched at the ends; leaves oval to orbicular, often golden beneath, spinulose-dentate, 4 to 12 lines long; sepals and stamens 4 or frequently 5; berry bright red, ovoid, 2½ lines long.—Inner Coast Range (w. Glenn Co., Vaca Mts., Mt. Diablo); Sierra Nevada foothills; coastal S. Cal. Var. INSULÀRIS Sarg. Tree 15 to 30 ft. high; similar to var. ilicifolia; leaves less prominently or scarcely at all toothed and berries larger.—Santa Barbara Isls. Var. PILÒSA Trel. Leaves more or less pilose.—Mts. of San Diego Co. (R. pilosa Abrams.)

3. CEANÒTHUS L.

Shrubs or small trees with petioled leaves, the branchlets often divaricate and rigid, sometimes spinescent. Flowers small but showy, borne in panicles or umbels. Calyx 5-lobed, the lower part adnate with the thick disk to the lower part of the 3-celled ovary. Petals 5, hooded by the inflexion of the acuminate apex, and with long claws. Stamens 5, filaments filiform, long-exserted. Style 3-cleft. Capsule subglobose, 3-celled, 3-lobed, becoming dry and separating into its 3 carpels, these elastically dehiscent along the inner edge and dispersing the seeds. Seeds obovate, convex on the back. (Greek Keanothus, name used by Dioscorides to designate some spiny plant.)

A. Leaves alternate, entire or if not entire the teeth usually glandular; stipules thin, fugacious or deciduous; flowers in small umbel-like clusters which are racemosely disposed along a simple axis ("simple panicle") or along a more or less branched axis ("compound panicle"); capsules often ridged or crested on back of the lobes or cells, never with horns.—Subgenus Euceanothus.

1. Branchlets mostly flexible; spines none; bark green or brown.

Panicles mostly simple; flowers blue, mostly deep blue; foliage evergreen; leaves pinnately nerved (except in no. 8).
Branchlets terete; leaves pinnately nerved, usually with conspicuous glandular teeth, commonly of unequal size but mostly small, often thickly set on the branchlets or even crowded; panicles small, often subglobose or short-oblong, frequently on long peduncles; low or prostrate shrubs.
Leaf margin flat, glandular-toothed.
Leaves dull above.
Stems creeping; leaves rounded, villous pubescent; panicle few (3 to 8)-flowered.....1. *C. diversifolius.*
Stems not creeping; low flat-topped shrub; leaves pale and pubescent beneath.....2. *C. lemmoni.*
Leaves glossy or waxed above; low, densely branched.
Peduncles mostly 2 to 5 lines long; cent. Cal. near coast.....
3. *C. foliosus.*
Peduncles 1¼ to 2 in. long; San Diego Co.....4. *C. austromontanus.*
Leaf margin revolute.
Upper surface all over papillate; panicle oblong.....5. *C. papillosus.*
Upper surface papillate on margin; panicle subglobose.....6. *C. dentatus.*
Branchlets angular; leaves greener above than below; tall shrubs or small trees.
Leaves pinnately veined, with revolute edges.....7. *C. parryi.*
Leaves strongly 3-nerved, plane.....8. *C. thyrsiflorus.*
Panicles large and commonly compound (except no. 12); leaves mostly 3-nerved.
Leaves serrulate, ample, prominently 3-nerved; branchlets stout.
Foliage evergreen, firm and thick.
Flowers pale blue; leaves green but dull above, whitened beneath; small tree; Santa Barbara Isls.....9. *C. arboreus.*
Flowers white; leaves deep green and shining or varnished above; mostly northern mountains.....10. *C. velutinus.*
Foliage deciduous, thinner; flowers white; Siskiyou Co. and n..11. *C. sanguineus.*
Leaves entire, mostly medium or small, distinctly or obscurely 3-nerved, rarely pinnately nerved; branchlets slender; foliage mostly deciduous.
Low shrub; panicle subsimple, the peduncles short; flowers blue; capsule nearly crestless; leaves oblong, small.....12. *C. parvifolius.*
Tall shrub; panicle compound, the peduncles long; flowers commonly white, sometimes blue or pinkish; capsule commonly with oblong glands.....
13. *C. integerrimus.*

2. Branchlets more or less rigid and divaricate, spinose or subspinose; bark mostly white or gray; panicles mostly short-peduncled.

Capsules mostly crestless; flowers white or blue.
Branchlets with greenish or brownish bark, often angled, flexible but often with slender spines; leaves pinnately veined.....14. *C. spinosus.*
Branchlets with whitish bark, terete, rigid; leaves 3-nerved.....15. *C. divaricatus.*
Capsules crested.
Panicles simple, commonly cylindric; branchlets mostly rigid or stubby, not spinose, with greenish or brownish bark; leaves rather weakly 3-nerved, glandular-denticulate.
Flowers pale, sometimes deep blue.
Leaves white beneath with a dense close felt or tomentum.16. *C. tomentosus.*
Leaves short-pubescent, pale or greenish beneath.....17. *C. sorediatus.*
Flowers deep blue or purplish; leaves hirsute.....18. *C. oliganthus.*
Panicles compound, not cylindric; branchlets rigid and spiny; leaves strongly 3-nerved; flowers white.
Low flat-topped shrub; capsule ridge-crested; leaves mostly 5 to 10 lines long; high montane.....19. *C. cordulatus.*
Tall shrub; capsule conspicuously warty or wavy-ridged; leaves mostly 1¼ to 2½ in. long; near coast.....20. *C. incanus.*

B. Leaves opposite (except in 2 species), mostly thick and small, entire or with pungent-tipped teeth but never glandular; stipule-bases persistent, becoming warty and cork-like; flowers in sessile umbels; capsules commonly with horns as well as crests.—Subgenus Cerastes.

1. Leaves alternate or exceptionally opposite; flowers white; S. Cal.

Leaves mostly obcordate; capsule hornless.....21. *C. verrucosus.*
Leaves elliptic-obovate, entire, mostly retuse or notched at apex; capsule with stout horns.
22. *C. macrocarpus.*

2. Leaves opposite; rigidly branched shrubs.

Leaves not revolute.
Flowers white; leaves usually entire, the lower surface microscopically tomentose.
Leaves yellowish-green, denticulate all around; horns spreading..23. *C. greggii.*
Leaves grayish or pale green, commonly entire (rarely dentate at apex); horns erect.....24. *C. cuneatus.*

Flowers blue or purple (exceptionally white).
Erect or spreading shrubs.
Leaves pungently dentate on upper half.....25. *C. rigidus.*
Leaves coarsely spinulose-dentate.
Leaves mostly with 7 or 8 teeth on a side; stipules conic, straight; horns very stout; s. Sierra Nevada.....26. *C. pinetorum.*
Leaves mostly with 4 or 5 teeth on a side; stipules conic, often curved; horns slender; cent. Coast Ranges.....27. *C. jepsonii.*
Prostrate shrubs; flowers blue; leaves coarsely few-toothed towards apex.....28. *C. prostratus.*
Leaves somewhat revolute, pungently dentate, the lower surface densely white-tomentose..29. *C. crassifolius.*

1. **C. divérsifòlius** Kell. Stems prostrate, 2 to 4½ ft. long, with short ascending or erect branchlets; young stems short villous; leaves thin, broadly elliptical, obtusish or sub-acute at apex, mucronulate-serrulate and sometimes undulate, ½ to ¾ (or 1¼) in. long, green and pubescent above, pale and hirsutely tomentose beneath, the veins sometimes prominent; petioles 1 to 3 (or 6) lines long; panicles simple, small and few (3 to 8)-flowered, 5 to 7 lines long, on much longer peduncles; flowers blue or almost white; capsules with apical wing-like ridges, 1½ to 2 lines in diameter.—Ridges and flats in the mts., 3000 to 6000 ft.: Sierra Nevada from Tulare Co. to Shasta Co.; inner North Coast Range from n. Lake Co. to Trinity Co. It is widely distributed, forming soft gray-green mats in the pine woods, but is nowhere common.

2. **C. lémmoni** Parry. Low spreading shrub with long rigid or at least firm branches and light gray bark; branchlets usually short, tomentose or pubescent; leaves elliptical to broadly ovate, 3 to 12 lines long, microscopically serrulate, plane, nearly glabrous above, pale and pubescent beneath; petioles very short or almost none; panicles simple, oblong or globose, 5 to 12 lines long, the tomentose peduncles little or no longer; flowers blue; capsules 1¾ lines broad, rather strongly crested.—N. Sierra Nevada, 2000 to 3500 ft., from Placer Co. to Shasta Co.; not common. In habit very near C. parvifolius.

3. **C. foliòsus** Parry. Fig. 617. Depressed shrub (½ to 1 ft. high), commonly dense at base, with horizontally spreading or diffuse branches 1½ to 3 ft. long, or in chaparral often erect and 2 to 3 ft. high or taller; branchlets often long, straight, shortly villous; leaves broadly oblong, mostly obtusish, undulate or somewhat infolded longitudinally, quite glabrous or obscurely hairy on the veins beneath, 2 to 6 or 8 lines long, commonly with smaller ones fascicled in their axils, upper surface dark green, lower lighter green or whitish or glaucous, the minute teeth of the margin tipped with glands; petiole distinct but very short; panicles simple, globose to oblong, ¼ to 1 in. long, the peduncles naked, 2 to 5 (or rarely 9) lines long; flowers blue; capsules 1½ lines broad, smooth, reddish, lobed, crested.—North Coast Ranges, mainly on exposed slopes and ridges, 200 to 3500 ft.: Mt. Tamalpais, abundant; Hood's Peak Range; Mt. St. Helena, abundant; Mt. Hanna, Lake Co.; w. Mendocino Co. (where it becomes 16 ft. high); also in the Santa Cruz Mts.

617. Ceanothus foliosus Parry; fl. branchlet x 1.

4. **C. áustromontànus** Abrams. Erect shrub 4 to 8 ft. high, similar to no. 3; capsules shallowly lobed. — Cuyamaca Mts., too little known.

5. **C. papillòsus** T. & G. Open irregularly spreading shrub, 4 to 6 ft. high; foliage and inflorescence usually crowded on the branches;

stems and peduncles hirsutulose; leaves oblong to linear, or even narrowly linear by the strong revolution of the margin, ½ to 2¼ in. long, obtuse at base, rounded or truncate at summit, the upper surface deep green, minutely hirsutulose, usually corrugated or roughened and thickly sprinkled with glandular-papillate protuberances, the lower surface pale pubescent or more commonly densely whitish felt-like and often in addition hispidulose; panicles simple, cylindric or very short cylindric, usually dense, ½ to 1¾ in. long, the peduncles naked, solitary or clustered, as long or often much longer; flowers blue; capsules distinctly 3-lobed with low narrow or lineate crests, 1½ lines broad.—South Coast Range on the mountain ridges lying next the ocean from the Santa Cruz Mts., where it is frequent, especially in the Redwood forest, to the Santa Lucia Mts. and San Luis Obispo Co. Var. RÈGIUS Jepson n. var. Papillae absent or nearly so.—Kings Mt., San Mateo Co. (C. F. Baker 804, type).

6. **C. dentàtus** T. & G. Low densely branched shrub 1 to 3 ft. high; branchlets and peduncles tomentulose or pilose; leaves obovate or elliptical, becoming strongly or irregularly revolute and therefore narrow or irregular in outline, usually truncate or retuse at apex, the infolding of the margin often such as to increase the prominence of the apical notch, pubescent on both surfaces and pale below, glandular-papillate on the (apparent) margin, 3 to 5 (or 12) lines long but of very unequal size; panicles simple, cylindric to globose, ½ to 1¼ in. long, on leafy peduncles nearly as long; flowers blue; capsules 2 lines broad, with prominent thin crests.—Santa Cruz Mts. to Monterey and doubtless southward where it insensibly passes into the first variety. Var. IMPRÉSSUS Trel. Prostrate; leaves roundish, with deep straight furrows or impressions on the upper surface over the veins.—Santa Maria to Santa Barbara. Var. LOBBIÀNUS Jepson n. comb. Leaves sparingly glandular, little revolute, of more regular outline than in species.—Wm. Lobb 117, doubtless Monterey Co., but the special locality not known; related to C. foliosus and possibly better regarded as a form of that species. (C. lobbianus Hook.) Var. FLORIBÚNDUS Trel. Flowers in dense globose subsessile clusters which closely crowd the branches.—Monterey. It has been treated as a hybrid but we see no necessity for so regarding it. (C. floribundus Hook.)

618. Ceanothus thyrsiflorus Esch.; *a*, fl. branchlet x ½; *b*, fl. x 2; *c*, capsule x 3.

7. **C. párryi** Trel. LADY-BLOOM. Shrub 4 to 6 (or 18) ft. high; branchlets angular and, when young, tomentose, the 1-year-old ones reddish; leaves pinnately veined, narrowly to broadly oblong, ¾ to 1½ in. long, dark green above, cobwebby-tomentose beneath, the margin denticulate but seemingly entire because soon revolute; petioles 2 lines long; panicles simple, oblong or distinctly broader below, 1 to 3 in. long, on sparsely leafy peduncles twice as long; bractlets white, hairy; flowers blue; capsules globose, smooth, 2 lines broad.—Cañons, Napa Range to Humboldt Co., frequent.

8. **C. thýrsiflòrus** Esch. BLUE BLOSSOM. Fig. 618. Shrub 3 to 8 ft. high, or becoming a small tree up to 18 or 25 ft. high, rather straight-limbed, the branchlets strongly angled and mostly ascending; leaves elliptical or oblong-ovate, green on both surfaces, glabrous and shining above, paler and usually scantily hairy along the veins beneath, strongly 3-nerved beneath, the margin mucronate-

serrate or serrulate with somewhat impressed glandular teeth, ¾ to 2 in. long; flowers blue, rarely varying to white, borne in panicles; panicles dense, ¾ to 3 in. long, on somewhat leafy peduncles 2 to 4 in. long; capsules globose, smooth, little lobed, 1½ to 2 lines broad, glandular and black when ripe.—Cañon sides, 10 to 1500 ft., Coast Ranges from Monterey Co. to Del Norte Co.; n. to Ore. It follows very closely and is especially abundant in the Redwood belt. It is also called Blue Myrtle and California Lilac. Var. GRÍSEUS Trel. Branchlets stout; leaves roundish-ovate to elliptic, obtusish, silky beneath with dense short hairs, as much as 1¾ in. long, the margin revolute between the low teeth; panicles rather large (1¼ in. long) but dense and compact.—Ft. Ross and Monterey. Var. CHÁNDLERI Jepson n. var. Branchlets slender; leaves small (10 lines long or less), puberulent beneath; panicles subglobose, 7 to 8 lines long on peduncles 2 to 3¾ in. long; flowers pale blue.—Pajaro Hills (Chandler 402, type).

9. **C. arbòreus** Greene. Shrub, or often a small tree, 12 to 20 ft. high with distinct trunk and round but open crown; branches woolly-puberulent; leaves broadly ovate to elliptic, obtuse or acutish, rounded to obscurely obcordate at base, mucronate-serrulate, 1 to 3 in. long, above dark green and glabrescent, beneath 3-ribbed and whitened (or light slate-color) with a thin but close fine felt; panicles compound, 2 to 3⅓ in. long; flowers pale blue, fragrant; capsules large (4 lines broad), blackish when ripe and strongly ridge-crested on the back of the lobes and strongly wrinkled all over.—Santa Barbara Isls.: Catalina Isl.; Santa Cruz Isl. It is remarkable for its ample foliage, much whitened beneath, and large leaf scars on the old wood. Var. GLÀBER Jepson. Herbage glabrous or nearly so.—Santa Rosa Isl. (T. Brandegee, type).

10. **C. velùtinus** Dougl. TOBACCO BRUSH. Stems several or many from the base, commonly diffusely spreading and forming a low rounded shrub 2 to 5 ft. high, rarely tree-like and up to 12 ft. high; herbage with a strong cinnamon odor; leaves round-ovate or elliptic, obtuse at apex, rounded or subcordate at base, glandular-serrulate, 1 to 3½ (mostly 1½ to 2½) in. long, dark green, glabrous and usually glandular-varnished above, often drying chocolate-brown, pale and with a very minute close pubescence beneath, the veins puberulent, strongly 3-nerved, the lateral nerves with marked marginal veins; panicles ¾ to 3¾, commonly 2 to 3 in. long; flowers white; capsules lobed at top, very sticky-glandular, 2 lines broad, crests small or almost none.—Mountain slopes, often extensively gregarious (especially northward): Sierra Nevada, 5000 to 7000 ft., from Tulare Co. to Modoc Co.; thence w. to Siskiyou and Del Norte Cos.; n. to Wash. and northern Rocky Mts., e. to Nev. Also called Snow Brush, Mountain Balm and Sticky Laurel. Var. LAEVIGÀTUS T. & G. Veins beneath glabrous.—Mt. St. Helena to Humboldt Co. and n. Var. LORENZÈNII Jepson n. var. Leaves smaller, 1 to 1¼ in. long, the two sides less unlike, not varnished above; panicles smaller.—Mt. Shasta (L. N. Lorenzen); near Junction Mdw., Kern Cañon (Jepson 5021, type).

11. **C. sanguíneus** Pursh. OREGON TEA-TREE. Tall shrub; branchlets reddish, flexible; leaves broadly ovate, roundish or subcordate at base, 3-ribbed, nearly glabrous, serrate, thin, 1½ to 2½ in. long; panicles on old wood from lateral winter buds, compound, 2 to 4 in. long, commonly on short leafless peduncles; flowers white; capsules 1½ to 2 lines broad, crestless.—Siskiyou Co. (Humbug Mt.; Moffitt Creek); n. to B. C. and Ida. A rarity with us.

12. **C. parvifòlius** Trel. SWEET BIRCH. Fig. 619. Low flat-topped shrub with slender flexible branches, 2 to 4 ft. high; herbage glabrous or nearly so; leaves oblong, entire, obtusish, ½ to 1 in. long; panicles simple, cylindric, ½ to 1 (rarely 2) in. long, the peduncles rather shorter, sometimes longer; flowers deep or pale blue; capsules 2½ lines broad, nearly crestless.—Mountain flats or ridges, 4700 to 6500 ft., Sierra

619. C. parvifolius Trel.; fl. branchlet x 1.

620. Ceanothus integerrimus H. & A.; *a*, fl. branchlet x ½; *b*, capsule x ⅔.

Nevada from Tulare Co. to Calaveras Co. It may be recognized by its rotately spreading stems, small entire leaves and simple inflorescence.

13. **C. integérrimus** H. & A. DEER BRUSH. Fig. 620. Widely branched shrub, 4 to 12 ft. high, often of greater breadth; bark yellowish-green; branches slender, often half drooping, ending in pliant green branchlets; leaves ovate or oblong-ovate, entire, ¾ to 2 (or 3) in. long, 3-nerved from the base, glabrous or minutely pubescent, green above, lighter green below; panicles compound, thyrsoid or pyramidal, sometimes simple, 3 to 5 in. long, the leafy or nearly leafless peduncles as long or longer; flowers commonly white, sometimes pale blue or pink; capsules globose, 2 to 2½ lines broad, somewhat 3-lobed, with oblong glands or evanescent crests on the back of each lobe near the middle. — Mountain slopes and ridges: Sierra Nevada, 3500 to 6000 ft. in the south and 2000 to 5000 ft. in the north; Coast Ranges (Mt. Shasta, Yollo Bolly, Mayacamas, Santa Cruz and Santa Lucia ranges), 1500 to 4000 ft.; San Gabriel, San Bernardino and San Jacinto mountains, 5000 to 7000 ft. The Coast Range form is often small leaved and commonly blue-flowered. At lower altitudes and in S. Cal. mts. the leaves are often puberulent above (= var. puberulus Abrams). Var. PEDUNCULÀRIS Jepson n. var. Panicles long and narrow, on peduncles nearly as long (3 to 4 in.).—Shasta and Trinity Cos. (Shasta Sprs., Jepson, type).

14. **C. spinòsus** Nutt. RED-HEART. Straggling shrub 5 to 10 ft. high, or forming a small tree up to 24 ft.; branchlets flexible, often ridged, glabrous or nearly; bark of the branchlets greenish-yellow, spines (not always present) slender, rigid, leafy below the middle; leaves oblong to elliptic, obtuse or emarginate, entire or serrulate, nearly or quite glabrous, ½ to 1 or 1½ in. long, drying reddish-brown above, greenish below, obscurely pinnate-veined; panicles simple or compound, long and narrow, sometimes pyramidal or loose, usually interrupted and leafy below, 1¼ to 4½ in. long; flowers pale blue or white; capsules scarcely lobed, resinous, not crested, 2 to 2½ lines broad.—Mountains near the south coast: San Luis Obispo; Santa Inez Mts.; Ojai Valley; Santa Monica Mts.; Santa Ana Mts., Orange Co. Var. PÁLMERI Jepson n. comb. Not divaricate nor spinose; glabrous throughout or very nearly; panicle compound, 2 to 6 in. long; flowers white; capsules narrowly ridged or crested. Palomar Mt.; Cuyamaca Mts. (C. palmeri Trel.; not C. spinosus var. palmeri K. Bdg.)

15. **C. divaricàtus** Nutt. Fig. 621. Shrub 5 to 14 ft. high, with white bark; branchlets rigid, divaricate, subspinose, whitish or glaucous; leaves thickish, ovate, rounded at base, subacute at apex, entire or glandular-serrulate, ½ to 1¼ in. long, short-petioled, glabrous or almost so above and commonly drying brownish, paler beneath and puberulent, especially along the veins, and often drying dull reddish; panicle simple, often long and narrow, often interrupted below, 1 to 2 in. long on much shorter naked or scarcely leafy peduncles, or at times almost sessile; flowers white or blue; capsules little lobed, not crested or scarcely, but very glandular, 2 to 2½ lines broad.—Foothills and mts., 900 to 5000 ft.: San Gabriel, San Bernardino, San Jacinto and Cuyamaca mountains; n. through Santa Barbara Co. to the Mt. Hamilton Range, n. through the Sierra Nevada to Mariposa Co.; s. to L. Cal. An important member of the chaparral in its region. Var. LAETIFLÒRUS Jepson n. var. Panicles sometimes compound and very large,

4 to 6 in. long.—Palomar Mt. (Pala Mission, Jepson 8494, type). Var. EGLANDULÒSUS Torr. Leaves small, entire, glabrous or nearly, glaucous; flowers white, sometimes blue. — San Gabriel Mts., 4000 to 6000 ft. Var. GROSSE-SERRÀTUS Torr. Leaves large, strongly serrate, acute.—San Gabriel Mts.

16. **C. tomentòsus** Parry. Shrub 4 to 8 ft. high; branchlets long and very slender, with gray or reddish bark, the young shoots rusty-tomentose; leaves ovate to oblong-elliptic, obtuse, thickish but brittle, mostly 6 to 10 lines long (varying from 3 to 14 lines), obtuse, glandular-serrate, above dark green and minutely pubescent, beneath bright white with a close tomentose covering, or velvety, or sometimes rusty, sometimes merely pubescent; petioles 1 to 2 lines long; panicles lateral or terminal, mostly cylindric, ½ to 1½ (or 2) in. long, often interrupted below, borne on peduncles 5 to 10 lines long which often bear 1 or 2 small leaves at base; flowers azure-blue (sometimes nearly white); capsules 3-lobed, 2 lines broad; crests thin.—Foothills, 300 to 2500 ft., Sierra Nevada from Placer Co. to Mariposa Co.; not common. Apparently hybridizes with C. integérrimus. Var. OLIVÀCEUS Jepson n. var. Leaves olive-green beneath with a fine dense felt-like covering, the margin glandular-denticulate, rarely serrate.—San Bernardino Valley to San Diego. Co. (Clevinger Cañon, Ramona, Jepson 8509, type); s. to L. Cal.

621. Ceanothus divaricatus Nutt.; *a*, fl. branchlet x 1; *b*, capsule x 2½.

17. **C. soredià̀tus** H. & A. JIM BRUSH. Erect shrub 4 to 7 ft. high with rigid divaricate branchlets; branchlets sparingly villous, at length olive-color or purplish; leaves ovate or elliptic-ovate, green above, paler or whitish and slightly pubescent beneath, glandular-denticulate, 3-nerved, 5 to 10 lines (or to 1½ in.) long, on petioles a line or two long; panicles simple, terminal or subterminal, 1 or 2 (to 6) on each branchlet, ovate or broadly oblong, ½ to 1¼ in. long; flowers blue or almost white; capsules lobed, crested, 2 to 2½ lines broad.—N. and e. slopes of cañon sides, 500 to 2500 ft., Monterey Co. to Mendocino and w. Solano Cos. It often forms extensive thickets.

18. **C. oligánthus** Nutt. Shrub, often with tree-like trunk, 4 to 9 ft. high; branchlets densely short hispid or villous, sometimes glabrescent, sub-flexible; leaves ovate, obtuse or sub-acute, rounded at base or subcordate, denticulate, the teeth mostly glandular, ½ to 1½ in. long, thinly or scantily pubescent above, drying brown or blackish, beneath pale green or chestnut brown and pubescent or hirsute, especially along the veins; panicles mostly simple, broad, more or less open, ¾ to 1½ in. long; flowers deep blue or purplish; capsules roughly resinous, rather strongly crested, slightly depressed, 2 to 2½ lines broad.—Near the coast from San Luis Obispo Co. to Santa Barbara and the San Gabriel Mts. Var. ORCÚTTII Trel. Flowers paler blue; fruit strongly rugose and loosely villous.—Mountains of San Diego Co., 500 to 1500 ft. (C. orcuttii Parry.)

19. **C. cordulàtus** Kell. SNOW-BRUSH. Low widely-spreading thorny shrub (1 to 4 ft. high and 3 to 9 ft. across), rigidly and intricately branched, its whitish somewhat crooked branches spreading horizontally or eventually recumbent, rather closely armed with stout spine-tipped leafy or flower-bearing branchlets; leaves elliptic or ovatish, obtuse, rarely roundish and subcordate at base, entire, or rarely denticulate, minutely puberulent, or almost glabrous, 3-nerved from the base, ¼ to ¾ (or 1) in. long; flowers white; panicles simple or subsimple, small, but usually dense, broadly oblong or ovatish, ½ to 1¼ in. long; capsules lobed, nearly 2 lines broad, ridged on the back of each cell.—Open or thinly forested slopes and ridges, 4000 to 7500 ft.: San Jacinto, San Bernardino and San Gabriel mountains; Sierra Nevada; Yollo Bolly Mts.; Mt. Shasta; n. to Ore. Closely related to C. divaricatus but growing at much higher altitudes and of different aspect.

20. **C. incànus** T. & G. "WHITE THORN." Shrub 4 to 8 ft. high, with white bark and very glaucous branchlets; branchlets thick, stout and short like bluntish apple tree spurs, or on vigorous shoots slender spinose; leaves ovate to elliptic or roundish, acute or obtuse, entire (rarely serrulate), rounded at base, 1¼ to 2½ in. long, strongly 3-ribbed from the base, above glabrous and green, often drying dark brown, whitish beneath with a very fine close indument; petioles 2 to 7 lines long; panicles compound, ½ to 1¾ in. long, their axes finely velvety; flowers white; capsules all over thickly warty or wavy-ridged, shallowly lobed at top, 2½ lines in diameter. —Along stream banks or swales in the Coast Ranges: Santa Cruz Mts. to w. Lake Co. and sw. Humboldt Co.

21. **C. verrucòsus** Nutt. Small shrub; leaves roundish-obcordate or deltoid-obovate, commonly retuse or truncate at apex, 4 to 9 lines long, entire or some of the leaves dentate or denticulate along the sides, green and glabrous above, pale beneath; stipules spreading horizontally, finally large and wart-like, roughening the stems; capsules 2 to 3 lines in diameter, commonly hornless, but variable, sometimes with unequal or with rudimentary horns.—Low hills, w. San Diego Co.

622. Ceanothus cuneatus Nutt.; *a*, fl. branchlet x ½; *b*, fr. x 3½.

22. **C. macrocárpus** Nutt. Shrub 6 to 12 ft. high; branches very slender; leaves elliptic-obovate, sometimes varying to cuneate, ½ to 1 (or 1¼) in. long, thickish, entire or rarely retuse or notched at apex, glabrous above, finely and closely tomentose beneath between the straightish parallel veins; flowers white; umbels 1 to several on each short branchlet, only 1 to 3 flowers in each umbel setting fruit; capsules not lobed, 3 to 5 lines broad, provided with stout diverging lateral horns.—Mountains from Santa Barbara Co. to Orange Co.; Santa Barbara Isls.

23. **C. gréggii** Gray. Very rigid and intricately branched shrub 2 to 4 ft. high, closely related to C. cuneatus; leaves grayish-green, oblong to elliptical, acute at both ends or obtuse at apex, entire or sometimes denticulate, puberulent on both faces, 4 to 6 lines long; flowers white; horns of the capsules small, often unequal or rudi-

mentary, spreading from the middle.—Mountain slopes bordering the Mohave Desert and Death Valley region: San Bernardino Mts.; Tehachapi Mts.; s. Sierra Nevada (Tulare Co.); Panamint Range; e. to N. Mex., s. to Mex. Var. PERPLÉXANS Jepson n. comb. Shrub 2 to 5 ft. high; leaves obovatish, very thick, spinulose-dentate, yellowish-green, glabrous above but minutely papillate beneath with minute white-flocculent dots, 3 to 4 lines long; flowers white; capsules wth 3 small spreading horns borne on the middle of the lobes or sometimes none.—Summits and desert slopes: s. Sierra Nevada (Tulare Co.); e. San Bernardino Mts., s. along the San Jacinto Range to the Cuyamaca Mts. (C. perplexans Trel.)

24. **C. cuneàtus** (Hook.) Nutt. BUCK-BRUSH. Fig. 622. Rigid divaricately and densely branched shrub 4 to 14 ft. high, with gray bark; branchlets stout and short, often very unequal and interruptedly disposed; leaves oblong- or cuneate-obovate to broadly obovate, entire, light green above, paler beneath with a microscopic tomentum and often obscurely quilted, 2 to 7 (or 10) lines long, on very short petioles; umbels ½ to 1 in. broad, borne on short spur-like branchlets; flowers white, with sweetish odor; capsules globose or slightly oblong, 2½ to 3 lines long, with 3 short erect horns near the top.—Dry mountain slopes, ridges and semi-arid valleys, 300 to 4000 ft.: throughout the Coast Ranges, Sierra Nevada and mts. of S. Cal.; n. to Ore., s. to L. Cal. The most abundant and widely distributed species of the genus in Cal., it is commonly gregarious and forms extensive and impenetrable thickets on the driest or most rocky mountain sides. A constant species in the main parts of its range, it is somewhat variable on the margins of its distribution. The leaves on young crown-sprouts are regularly and coarsely dentate and commonly occur in threes. Cattlemen use for it the general term, chaparral. Var. RAMULÒSUS Greene. Possible hybrid with C. rigidus; branchlets more numerous; leaves somewhat floccose-tomentose beneath; flowers said to be scentless.—Napa Co. to Marin Co.

25. **C. rígidus** Nutt. Shrub 3 to 6 ft. high, rigidly and intricately branched with numerous often unequal branchlets; leaves rather crowded, cuneate-obovate, mostly retuse, of medium thickness but firm, soon nearly glabrous on both surfaces, the apical half finely dentate or quite entire, 2 to 5 lines long, nearly sessile; stipules conspicuously warty; flowers bright blue; capsules not lobed, 3 lines in diameter, provided with prominent horns.—Coast hills from Monterey to Mt. Tamalpais. Very closely allied to C. cuneatus and probably no more than a dentate-leaved blue-flowered state of it. Var. FRESNÉNSIS Jepson n. comb. Leaves narrow-obovate, more or less toothed at the truncatish apex, thinly woolly above, below with a minute quilted felt; capsules 2 lines long; horns slender.—Mountain ridges, Fresno Co., 4500 to 5200 ft. (C. fresnensis Dudley.)

623. Ceanothus jepsonii Greene; *a*, fl. branchlet x ½; *b*, fl. x 2; *c*, capsule x 2.

26. **C. pinetòrum** Cov. Low-spreading or erect shrub, ½ to 1 or up to 4 ft. high; leaves orbicular to elliptic, pungently dentate all around, shining and glabrous above, minutely flocculent beneath, ½ to 1 in. long; flowers blue, sometimes white, in dense umbellate clusters;

capsules 3 to 4 lines broad with prominent stout horns 1 to 1½ lines long.—Open pine woods, 7000 to 8800 ft., s. Sierra Nevada in the upper Kern River basin.

27. **C. jepsònii** Greene. MUSK-BUSH. Fig. 623. Rigid erect shrub 4 to 5 ft. high; branchlets short, rigid, with gray bark; leaves elliptic, coriaceous, green and glabrous above, tomentulose-areolate beneath, spiny-toothed, undulate-margined, or somewhat infolded longitudinally, 4 to 10 lines long; warty stipules small; flowers white or blue, exhaling a musky odor; pedicels 2 to 3 lines long; capsule 2 to 2½ or 3 lines broad, with horns 1½ to 2 lines long.—Mountain slopes: Lake Co. to Marin Co. Var. PURPÙREUS Jepson n. comb. Branchlets brownish or reddish; leaves thick, orbicular, 1 in. long or less, coarsely and pungently toothed all around; warty stipules large; flowers large, purple; pedicels 5 to 7 lines long.—Southern Napa Range. (C. purpureus Jepson.)

28. **C. prostràtus** Benth. MAHALA MAT. Prostrate plants, the branches thickly matting the ground, often rooting and forming dense mats 2 to 10 ft. broad; branchlets often reddish, at first pubescent; leaves green on both surfaces, glabrous or finely floccelent-pubescent beneath, thick and firm, cuneate-obovate, coarsely and pungently 3-toothed at the apex, and often with 1 or 2 similar teeth on each side mostly above the middle, 4 to 9 lines long (or even to 1¼ in. long); flowers blue; fruit globose, not lobed, 3 to 4 lines broad, with 3 large wrinkled horns and 3 intermediate crests.—Pine woods, 3000 to 7000 ft.: Sierra Nevada from Mariposa Co. to Mt. Shasta; Cobb Mt. to Yollo Bolly Mts.; Siskiyou Mts.; n. to Wash. Also called Squaw Mat. Var. LÁXUS Jepson n. var. Not so prostrate or so dense; branches ascending; leaves obovate, dentate, 9 to 10 lines long.—Hot Springs Valley near Lassen Peak (Jepson 4099, type). Var. DIVÉRGENS K. Bdg. Low scrambling shrub, the branches horizontally spreading or trailing; leaves strongly dentate-spinose; horns of capsule more lateral.—Mountain slopes: Mt. Konocti; Mt. St. Helena; Hoods Peak Range; Mt. Tamalpais; Santa Cruz Mts. Var. GRANDIFÓLIUS Jepson n. comb. Leaves ¾ to 1¼ in. long.—Coastal: Pt. Reyes peninsula to Sonoma Co. (C. rigidus var. grandifolius Torr.)

624. Adolphia californica Wats.; *a*, fl. branchlet x ½; *b*, fr. branchlet x ½; *c*, fl. x 9; *d*, fr. x 2.

29. **C. crassifòlius** Torr. Much-branched shrub 3 to 11 ft. high; leaves thick and coriaceous, elliptic, ½ to 1½ in. long, shortly petioled, dentate with the margin strongly infolded between the small teeth, or the teeth quite concealed by the strongly revolute edge, rarely entire, the upper surface light green, minutely roughened, the lower surface densely white-tomentose, more or less concealing the straight lateral veins; flowers white; capsules not lobed, 3 lines broad, provided with stout or minute horn-like crests.—Hills and mts. of cismontane S. Cal., 1000 to 3000 ft., from Santa Barbara Co. to San Diego Co.; s. to L. Cal.; common. Var. PLÀNUS Abrams. Leaves glabrescent or comparatively so, entire, plane.—Mts. of Santa Barbara and Ventura Cos.; Santa Cruz Isl.

4. **ADÓLPHIA** Meisn.

Rigid oppositely branched shrubs with numerous thorny branchlets obscurely jointed at base. Leaves opposite, petioled, stipulate, falling early. Flowers few in axillary clusters or only one. Petals strongly hooded. Ovary 3-celled, free from the calyx; style often jointed at or near the ovary, the portion above the joint deciduous; stigma 3-lobed. Capsule 3-celled, 3-lobed, the lower one-third surrounded by but mostly free from the persistent cup-like calyx. (Adolphe T. Brongniart, 1801-1876, French botanist who monographed the family Rhamnaceae.)

1. **A. californica** Wats. Fig. 624. Two to 3 ft. high; branchlets short, thorn-like, divaricately spreading; younger parts finely pubescent; leaves oblong or obovate, entire or nearly so, 1 to 3 lines long, shortly petioled; flowers 1 to 4 in a cluster, the pedicels 1 line long or in fruit 3 to 4 lines long; calyx greenish white; petals minute, white; disk dull green; capsule 2 to 3 lines broad; seeds smooth, 2 lines long.—San Diego Co.: Penasquitas; Sweetwater Dam; Chollas Valley; s. to L. Cal. Apr.

VITÀCEAE. Vine Family

Woody plants, mostly climbing by tendrils. Leaves in ours simple, alternate. Flowers small, regular, greenish or whitish, in a compound thyrse. Calyx minute, the limb mostly obsolete and truncate. Petals 5 (4 or 6), valvate, caducous or early deciduous, the stamens as many and opposite them. Fruit a 2-celled berry. Seeds with a thick and bony testa. Embryo minute, in a tough endosperm.

1. **VÌTIS** L. Grape

Leaves opposite the tendrils or flower clusters. Tendrils at least once branched. Calyx-tube filled with the disk, which bears the stamens and petals. Ovules 2 in each cell. (Classical Latin name.)

Young shoots and young leaves thinly arachnoid-tomentose or pubescent but mostly green; berries purple, very glaucous.....1. *V. californica.*
Young shoots and young leaves densely white-tomentose; berries black, only slightly glaucous.....
2. *V. girdiana.*

1. **V. californica** Benth. California Wild Grape. Fig. 625. Stems 5 to 60 ft. long; leaves roundish, pubescent or thinly arachnoid-tomentose, especially beneath, the tomentum in age flocculent, 2 to 5½ in. broad, coarsely or minutely dentate, cordate at base with open or closed sinus, slightly or not at all lobed, or sometimes a 3 to 5-lobed leaf with narrow sinuses at the next node above or below an unlobed one; petals and stamens 5; fruit purple, with a bloom, 3 to 5 lines in diameter.—Along streams throughout the Coast Ranges, Great Valley and Sierra Nevada foothills. Climbing trees, especially oaks and cottonwoods, and frequently killing such by covering them with its drapery of leaves. Very fragrant at flowering time (May-June) with a pleasant sweet odor.

625. Vitis californica Benth.; *a*, portion of fr. stem x ½; *b*, fl. with calyx breaking away x 4; *c*, fl. with calyx fallen x 4.

2. **V. girdiàna** Munson. Desert Grape. Stems 5 to 20 ft. long; leaves round-cordate, 2 to 5 in. wide, irregularly dentate, or more commonly promi-

nently lobed, the lobes typically contracted at base; upper side of leaves glabrate and green, under side arachnoid-pubescent; petals and stamens 6; berries black, slightly glaucous, 2 to 3 lines in diameter.—Coastal S. Cal., e. to the deserts, thence n. to Inyo Co.

MALVÀCEAE. Mallow Family

Herbs or soft-woody shrubs with mucilaginous juice, tough fibrous inner bark, and usually stellate pubescence. Leaves alternate, simple, palmately veined and commonly lobed, stipulate. Flowers commonly perfect, sometimes polygamous or dioecious, regular. Calyx with 5 lobes, valvate in the bud, often with an involucel of bractlets at base. Petals 5, twisted in the bud. Stamens indefinite, hypogynous, monadelphous in a column or tube around the pistils, the petals inserted on the base of the tube. Pistil 1, composed of several to many carpels, the superior ovary commonly with as many cells as styles or stigmas. Fruit a loculicidal capsule, or the carpels separating at maturity.

Anthers scattered along the outside of the tube of filaments; carpels or cells of the ovary 5 to 8.
  Involucel consisting of 3 to many distinct slender bractlets; stigmas capitate; fruit a loculicidal capsule ..... 1. Hibiscus.
  Involucel broadly 2 to 3-lobed; styles stigmatic lengthwise; fruit a depressed whorl of smooth carpels ..... 2. Lavatera.
Anthers borne in a cluster at the top of the tube of filaments; carpels several, crowded and united around a central axis, separating at maturity.
  Styles stigmatic lengthwise on the inside; herbs.
    Bractlets 3, distinct, inserted on the calyx ..... 3. Malva.
    Bractlets none or one and inserted on base of calyx ..... 4. Sidalcea.
  Styles with a terminal or capitate stigma.
    Bractlets slender or even filiform.
      Flowers cream-color; low decumbent herb ..... 5. Sida.
      Flowers roseate, rose-purple, yellow or white; shrubs or herbs.
        Carpels with 2 ovules, the ovules separated by transverse partitions; herbs ..... 6. Modiola.
        Carpels with 1 to 3 ovules, without transverse septa; shrubs or herbs.. 7. Sphaeralcea.
    Bractlets none; flowers salmon-color; woody plant ..... 8. Horsfordia.

1. HIBÍSCUS L. Rose-Mallow

Stout herbs. Flowers showy, in ours solitary. Involucel consisting of several to many slender bractlets. Stamen column with anthers scattered along the upper part but naked at the truncate 5-toothed summit. Ovary 5-celled with 2 to many ovules in each cell. Capsule loculicidal. (Greek name for the Marsh Mallow, used by Dioscorides.)

Leaves cordate; peduncles subterminal, 2 to 3 in. long, jointed near the middle, united with the petiole at base; calyx cleft to the middle; seeds globose, glabrous, minutely papillate ..... 1. *H. californicus.*
Leaves ovate; peduncles mostly axillary, 1 to 9 lines long; calyx cleft nearly to the base; seeds reniform, densely silky ..... 2. *H. denudatus.*

1. **H. califórnicus** Kell. Stems pubescent, cane-like, 3 to 7 ft. high; leaves cordate, dentate, acuminate, 2½ to 4 in. long; petioles 1½ to 2¼ in. long; calyx campanulate, cleft to the middle, conspicuously nerved at maturity and filled by the capsule; corolla white or roseate, with deep crimson center, 2½ to 4 in. long; capsule 1 to 1⅛ in. long.—Swamps and deltas, lower Sacramento and San Joaquin rivers.

2. **H. denudàtus** Benth. Pale Face. Stems slender, woody at base, somewhat flexuose above, 1 to 2 ft. high; herbage densely and closely tomentose; leaves ovate, serrulate, ½ to 1 in. long, short-petioled; flowers short-peduncled in the axils and along the somewhat naked flexuose summit of the branches; calyx 5-parted, canescent-tomentose; bractlets 3 to 7, setaceous, commonly less than half as long as the calyx or almost obsolete; petals white or pale lavender, often deep purple at center, ½ to 1 in. long; capsule acute, dehiscent to the base, shorter than the calyx.—Mesas and cañons, Colorado Desert; e. to Tex., s. to Mex.

2. LAVATÈRA L.

Ours shrubs with ample maple-like leaves and small caducous stipules. Flowers showy, axillary, subtended by a 2 to 3-lobed involucel. Pedicels jointed above the middle. Petals reflexed after anthesis, truncate or retuse,

long-clawed. Styles 5 to 8. Fruit a depressed whorl of smooth carpels. (Two brothers Lavater, Swiss physicians and naturalists.)

1. **L. assurgentiflòra** Kell. Shrub 4 to 10 ft. high; leaves palmately 5-lobed and dentately toothed; calyx-lobes triangular, acute, shorter than the tube; corolla 1½ to 2¼ in. broad, the petals rose-color with darker veins; claws bearded at base.—Santa Barbara Isls.; cult. on the mainland as a windbreak for gardens.

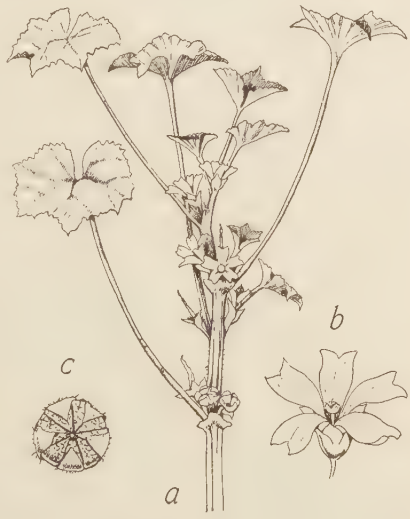
3. MÁLVA L. Mallow

Ours annuals or biennials. Involucre of 3 distinct bractlets, inserted on the base of the calyx. Calyx cleft to the middle into 5 broad lobes. Petals whitish or rose-color, obcordate or emarginate. Style-branches 7 to 10, subulate. Fruit circular and flattish, splitting up when ripe into about 6 to 12 carpels or nutlets. Nutlets round-reniform, 1-seeded. (Greek malache, soft, on account of the emollient properties.)

Petals much surpassing the calyx.
Carpels not reticulate, puberulent on back.....1. *M. rotundifolia.*
Carpels glabrate at maturity, rugose-reticulate on back, the margin entire or obscurely denticulate; calyx-lobes mostly closed over the mature fruit..2. *M. borealis.*
Petals slightly longer than the calyx; carpels rugose-reticulate on back, the margin winged and denticulate; calyx-lobes spreading or erect.....3. *M. parviflora.*

1. **M. rotundifòlia** L. Dwarf Mallow. Sparsely hispidulous or hirsute; stems slender, procumbent, 1 to 2 ft. long, from a large deep root; leaves rounded, crenate, slightly or scarcely at all 5 to 7-lobed; corolla surpassing the calyx, pale blue; carpels 14 or 15, puberulent, not reticulated on the back or at least not obviously so.—Nat. from Eur.; waysides and old gardens.

2. **M. boreàlis** Wallm. Bull Mallow. Fig. 626. Erect; leaves like no. 1; pedicels tending to be reflexed in fruit; bractlets ovate or lanceolate; corolla pinkish, 5 to 6 lines long, surpassing the calyx; carpels 7 to 9, dorsally rugose-reticulate or even somewhat favose, the margin entire or more or less denticulate. — Nat. from Eur.; weed about towns and cities.



626. Malva borealis Wallm.; *a*, fl. branchlet x ¼; *b*, fl. x 1; *c*, fr. x 1.

M. sylvéstris L. High Mallow. Corolla mauve or reddish-purple, 1 to 1½ in. broad. — Garden plant from Eur., an occasional escape: Guerneville; Redlands.

3. **M. parviflòra** L. Cheese-weed. Widely branching, 1 to 3 ft. high; petioles and ascending branches more or less stellate-hairy on the upper side, glabrous below; leaves roundish in outline, with a red spot at base of blade, shallowly 7-lobed, 5 in. broad or less, on petioles more than twice as long as the blade; flowers in rather close axillary clusters; bractlets linear; corolla pinkish with notched petals, 2½ lines long, slightly longer than the calyx; calyx commonly spreading under or about the mature fruit; carpels about 11, sharply rugose-reticulate and pubescent on the back, the margin winged and denticulate.—Nat. from Eur.; waste places, especially near dwellings.

M. pusílla Sm. Similar to no. 3; calyx-lobes usually closed over the fruit; pedicels usually somewhat longer, tending to be reflexed in fruit; margins of carpels obscurely if at all denticulate, not at all winged.—Adventive from Eur.: Alton, Humboldt Co.; San Pedro.

4. **SIDÁLCEA** Gray

Herbs. Leaves rounded, either crenate, crenately incised, parted or divided, or palmately lobed. Flowers in terminal spikes or racemes, either perfect, gynodioecious (that is, with perfect and pistillate flowers on separate plants, the pistillate flowers being smaller and with sterile stamens) or dioecious. Corolla purple, rose-pink or white. Bractlets none, rarely 1. Petals emarginate or truncate. Stamen-tube with double series of terminal free filaments, the filaments of the outer series often distinctly below the filaments of the inner series; filaments more or less united into sets. Fruit consisting of 5 to 9 carpels, commonly beaked. (Sida, a genus of this family, and Alkea, ancient name for a mallow, alluding to the appearance and relationship of these plants.)

A. Leaves round in outline, at least some (usually the upper) pedately parted or divided; flowers usually rose-pink or purple.—Subgenus EUSIDALCEA.

Annuals (except no. 5) with short roots; spring flowering; stamineal column conspicuously divided into outer and inner series.
- Carpels rugose-reticulate or somewhat favose on the back; annuals.
  - Bracts conspicuous, foliaceous, palmately divided into filiform segments; plants hairy.....1. *S. diploscypha.*
  - Bracts inconspicuous, narrowly linear and entire.
    - Herbage nearly glabrous to sparsely stellate-puberulent; carpels reniform, incurved at maturity; flowers sparse in short racemes; slender plants.....2. *S. hartwegii.*
    - Herbage more or less densely hirsute; carpels orbicular, not incurved at maturity; spike densely flowered; stout plants.....3. *S. hirsuta.*
- Carpels longitudinally grooved or striately nerved on the back.
  - Annual; stipules and bracts broadly to narrowly ovate, acuminate, 1 to 3 lines long.....4. *S. calycosa.*
  - Perennial; stipules and bracts broadly ovate, mostly obtuse, papery and purple-tinged, 4 to 8 lines long.....5. *S. rhizomata.*

Strong-rooted perennials, mostly summer flowering; lobes of the outer stamen-tube closely approximating those of the inner.
- Stems usually hirsute; leaves, inflorescence and calyx hirsute to stellate-pubescent; carpels usually reticulate, incurved at maturity and beaked.
  - Flowers in spikes.
    - Plants as a whole very hirsute, even on the calyx.
      - Spikes broad, very dense; plants coarse; coastal species..6. *S. eximia.*
      - Spikes narrow, often lax, sometimes interrupted; plants slender; mostly montane.....7. *S. spicata.*
    - Plants sparsely hirsute at base; inflorescence and calyx closely stellate-pubescent.....8. *S. oregana.*
  - Flowers in racemes; plants hirsute to stellate-pubescent; mostly coastal..... 9. *S. malvaeflora.*
- Stems not hirsute, usually glabrous and often glaucous, sometimes stellate-puberulent; leaves lightly stellate-puberulent or almost glabrous; carpels lightly reticulate to almost smooth.
  - Plants slender; racemes few-flowered; Sierra Nevada.....10. *S. glaucescens.*
  - Plants stout; racemes many-flowered; S. Cal.....11. *S. parviflora.*

B. Leaves roundish in outline, none parted or divided; carpels smooth (or nearly so); perennials.—Subgenus HESPERALCEA.

Flowers white, in oblong spikes; plants stout; leaves like those of a grape..... 12. *S. malachroides.*

Flowers rose-purple, in elongate spicate racemes; plants more slender; leaves crenate, orbicular.....13. *S. hickmanii.*

1. **S. diploscypha** (T. & G.) Gray. Stem erect and simple, or more robust and freely branching, 1½ to 2 ft. high; herbage pilose-hispid and also with a minute stellate pubescence; basal leaves more or less deeply crenate, the cauline parted and 2 or 3-cleft, the bracteal filiform-divided; flowers on short pedicels in umbellate clusters at the ends of the branches; calyx-lobes lanceolate-subulate; petals dark pink, with or without a dark purple center, minutely erose denticulate, ¾ to 1¼ in. long; filaments of the outer series united nearly to the summit into sets of 5 to 10; carpels nearly orbicular, dorsally reticulated; receptacle at separation of the achenes marked by as many obtuse longitudinal processes as there are carpels.—Open foothills or valleys, 20 to 2500 ft.: Coast Ranges from Humboldt Co. to Santa Clara Co.; Sacramento Valley; Sierra Nevada foothills from Calaveras Co. to Tulare Co.

2. **S. hartwégii** Gray. Stem slender, sparingly branched, 7 to 12 in. high; herbage sparsely stellate-pubescent or almost glabrous below, but scarcely or not at all hispid; leaves pedately 5 to 7-divided into linear entire divisions

or the lower with broader trifid divisions; flowers few in a short spike; filaments of the outer series closely approximating the inner, more or less united in pairs or sets as in the perennial species; corolla rose-purple, 6 to 8 lines long; carpels strongly incurved, favosely rugose-reticulate.—Dry hillsides: Napa Co. to Lake Co.; Sacramento Valley; Sierra Nevada foothills from Butte Co. to Calaveras Co. May.

3. **S. hirsùta** Gray. Stem erect, stout, 1 to 2 ft. high, its branches ending in dense spikes; herbage more or less hirsute-pubescent; cauline leaves palmately or pedately divided into 7 to 9 narrowly linear and entire acute divisions; bracts mostly small and inconspicuous; calyx densely cinereous-pubescent and hirsute, the tube somewhat chartaceous, the lobes triangular-lanceolate; corolla deep rose-color, ½ to 1 in. long; petals erect, induplicate; carpels more or less hirsute, orbicular, not incurved at maturity, reticulated on the back and tipped at the central apex with a bristly beak.—Low wet but soon desiccated spots: Sierra foothills from Tuolumne Co. to Butte Co.; Sacramento Valley; w. to Mendocino Co.

4. **S. calycòsa** Jones. Stem slender, sparingly branched, 1 to 3 ft. high; herbage glabrous or sparsely pubescent with scattered hairs; leaves roundish, crenate or crenately incised, ¾ to 1¼ in. wide, long-petioled, the upper divided into 6 or 7 linear divisions, stipules usually purple, the lower ones linear-acuminate, the upper becoming ovate, serrate and scarious; bracts stipular, parted into 2 ovate lobes, commonly glabrous; raceme spike-like, loose, few-flowered; calyx large, loose, often purple-tinged or scarious, thinly hirsute with long simple hairs, the lobes ovate, acuminate; corolla light purple, 8 to 12 lines long; carpels striate-ridged on the back, commonly reticulate on the sides, strongly incurved.—Valleys: Napa, Sonoma and Marin Cos.; Sierra Nevada foothills from Butte Co. to Mariposa Co. (S. sulcata Curran.)

5. **S. rhizómata** Jepson n. sp. Stems succulent, green or purplish, erect or ascending, 1½ ft. high, the decumbent or prostrate base rhizomatously rooting; herbage mostly glabrous below or sparingly hirsute above; basal leaves 1 to 4 in. broad, crenately but shallowly incised, long-petioled; cauline leaves divided into 8 or 11 broadly cuneate divisions; stipules 4 to 8 lines long, broadly ovate, acuminate, or obtuse and toothed, green or purple; bracts scarious to membranous, hairy, deeply 2-lobed (the lobes ovate, acuminate), 4 to 6 lines long; flowers in short spikes; spikes short, dense, ½ to 1¼ in. long; calyx densely hairy, the hairs straw-color, long, simple; calyx-lobes ovate, acuminate, scarious and purple-tipped, 3 to 6 lines long; corolla light purple, ¾ to 1 in. long; carpels purple-tinged, strongly striate-grooved on the back and lightly reticulate on the sides, strongly incurved; beaks very slender, soon deciduous.—Marshes, Pt. Reyes peninsula (Russell Ranch, Jepson 1174, type).

6. **S. exímia** Greene. Stems stout, erect or decumbent at base, paniculately branched above, 2 to 3 ft. high; herbage, especially the stems, markedly hirsute; lower leaves palmately cleft or divided (the divisions 3-lobed), 3 to 5 in. wide, on petioles 7 to 19 in. long; upper leaves divided into 5 to 9 linear or oblong segments 2½ to 3 in. long, shortly petioled (the petioles 1 to 3½ in. long); spikes very dense, ¾ to 2¾ in. long; bracts linear, entire or deeply notched, purple-tinged, hairy, 2 to 4 lines long; calyx conspicuously hairy on short hairy pedicels, the lobes triangular-acuminate, 3 to 6 lines long; calyx in fruit papery, 5 to 6 lines long; carpels smooth, 1 to 2 lines long, slenderly beaked; seeds blackish.—Meadows, Humboldt Co., 30 to 3500 ft.

7. **S. spicàta** Greene. Stems slender, often paniculately branched above 1 to 4 ft. high; pubescence hirsute on the stem, petioles, and particularly on the calyx; leaves roundish in outline, crenately lobed or incised or parted, 1 to 1½ in. broad, almost glabrous to densely stellate-pubescent; upper leaves pedately parted; spikes commonly dense, 1 to 4 in. long; flowers 4 to 7 lines long; calyx usually densely hirsute (sometimes not), the lobes ovate, acute or acuminate, 2 to 4 lines long; petals narrow, notched at apex, 4 to 8

lines long; carpels small, 1 line long, more or less tomentose, not reticulate, slightly beaked, the beak hairy.—Meadows and along rivulets, montane, 4000 to 9000 ft.; Sierra Nevada from Tulare Co. to Nevada Co.; Trinity Co. Var. RÉPTANS Jepson n. comb. Stems at base creeping and rooting; spikes loose.—Sierra Nevada from Amador Co. to Tulare Co., 4000 to 6500 ft. (S. reptans Greene.) Var. PEDÀTA Jepson n. comb. Leaves once or twice pedately divided into linear segments ¼ to ½ line wide; spikes often loose.—San Bernardino Mts. (S. pedata Gray.)

8. **S. oregàna** Gray. Stems few from a woody root-crown, nearly naked above and paniculately branched, 1 to 5 ft. high; plant more or less thinly hirsute below, the leaves and inflorescence finely stellate-pubescent; lower leaves round in outline, shallowly toothed or cleft (rarely deeply parted), 3 to 4 in. broad; cauline leaves incisely parted with the lobes toothed or cleft, or the uppermost pedately divided into 5 to 7 lanceolate, linear or 3-lobed divisions; spikes many, dense, typically oblong, 1 to 2 in. long (much elongated in fruit), long-peduncled; bracts narrowly linear or subulate; calyx 1 to 3 lines long, its lobes ovate, acute, about as long as the tube; corolla rose-pink, 5 to 6 lines long; carpels semi-orbicular, slightly beaked, glabrous and smooth or sometimes slightly wrinkled on the sides near the dorsal angle, 1 line long.—Mountain meadows, 2500 to 4500 ft.; Coast Ranges from Napa Co. to Siskiyou Co., thence s. in the Sierra Nevada to Nevada Co.; n. to Ore.

627. Sidalcea malvaeflora Gray; *a*, base of plant x ½; *b*, male fls. x ½; *c*, female fls. x ½; *d*, achene x 3.

9. **S. malvaeflòra** Gray. CHECKER BLOOM. Fig. 627. Stems several from a woody root-crown, simple or branched, erect or half decumbent at base, 1¼ to 2 ft. high, retrosely hispid below with scattered hairs, usually stellate-pubescent above; basal leaves crenate or crenately incised or cleft into cuneate-obovate 2 to 4-toothed lobes, 1 to 2 in. wide; upper leaves palmately twice cleft into linear or narrowly oblong divisions; raceme rather loose, 3 to 12 in. long; bracts ovate, herbaceous, often notched at apex or decidedly bifid; flowers of two sorts: one perfect with large corollas, the other pistillate with small corollas; corolla of perfect flowers ½ to 1¼ in. long, the outer series of filaments united for about half their length into sets of 4 and 2, the inner filaments mostly distinct; corolla of pistillate flowers 4 to 7 lines long, the filaments destitute of good anthers; carpels subglabrous, more or less rugulose-reticulate and beaked, the beaks often hairy at tip.—Open hills, 50 to 1500 ft., near the coast from Mendocino Co. to San Luis Obispo Co. and s. to coastal S. Cal. Var. CALIFÓRNICA Jepson n. comb. Herbage mostly stellate-pubescent; calyx-lobes 3 to 5-nerved; carpels hispidulose.—Santa Inez Mts. (S. californica Gray.) Var. ASPRÉLLA Jepson n. comb. Stems lightly scurfy-pubescent; leaves and inflorescence stellate-puberulent; leaves divided into 3 to 5 usually equal mostly entire divisions.—Sierra Nevada foothills, 1500 to 2500 ft. and sometimes to 5000 ft., from Mariposa Co. to Shasta Co., thence w. to Humboldt Co. (S. asprella Greene.)

10. **S. glaucéscens** Greene. Stems slender, 1 to 2 ft. high; herbage minutely stellate-puberulent or glabrous, glaucous; leaves palmately cleft or divided, ¾ to 2 in. wide, the divisions entire or few-toothed; pedicels and calyx somewhat stellate-puberulent; bracts bifid; corolla 5 to 7 lines long; carpels large, inflated, lightly reticulate and dorsally grooved; beaks small, erect or entirely absent.—Montane, 4000 to 7000 ft.: Shasta Co. to Kern Co.

11. **S. parviflòra** Greene. Stems stout, 1½ to 4 ft. high; herbage nearly glabrous throughout, or (especially the leaves) sparsely hirsute or somewhat stellate-pubescent; leaves palmately toothed, cleft, parted or divided, 1 to 2 in. wide; racemes long, slender; bracts slender, bifid; calyx slightly hirsute or sparsely stellate-pubescent, its segments acute, 3 to 5-nerved, 3 lines long; petals rose-color, erose at summit, 3 to 6 lines long; carpels glabrous, lightly reticulated when mature; beaks small, recurved.—Brackish marshes: San Bernardino Valley and Santa Monica to the Ojai and Antelope valleys; San Luis Obispo Co.; Mohave Desert.

12. **S. malachroìdes** Gray. Stems stout, 2 to 4 ft. high, equably leafy to the summit, several from the base, simple below, ending above in a panicle of spikes; herbage stellate-hispidulous; leaves vitiform, palmately but shallowly lobed, unequally dentate, 1 to 6 (mostly 2 to 3) in. broad; spikes oblong, very dense, ½ to 2½ in. long; bracts linear or subulate; calyx-lobes ovate, acuminate; petals white, broad, broadly notched, abruptly clawed; staminate flowers with the filaments of the outer series united for about ½ their length or less into pairs, or two such pairs slightly united by their bases making a set of 4; carpels sometimes present; pistillate flowers 3 to 3½ lines long, the tube of filaments short, more or less truncate and without anthers; carpels 7 to 9, half dehiscent by a ventral suture.—Seaboard species, Santa Lucia Mts. to Del Norte Co.

13. **S. hickmánii** Greene. Stems several, erect, 2 to 3 ft. high, leafy throughout; herbage stellate-pubescent, sometimes densely so and almost tomentose, and even somewhat hirsute, especially on calyx; leaves roundish, serrate or shallowly incised, 1¼ to 2 in. wide, the lowest smaller than the middle ones; petioles usually longer than the blade; racemes many, 3 to 7 in. long, the pedicels 1 line long; bracts narrowly linear, villous; calyx-lobes ovate, acuminate, thin, sandy-pubescent, 3 to 6 lines long; corolla rose-purple, 7 to 8 lines long; carpels mostly smooth.—Monterey and San Benito Cos. Var. PARÍSHII Rob. Stems 1 to 1½ ft. high; leaves ½ to 1 in. wide; corolla 4 lines long.—San Bernardino Mts., 6000 ft. (Malvastrum confertum Parish.)

628. Sida hederacea Torr.; *a*, fl. branch x ½; *b*, long. sect. of fl. x 1; *c*, calyx and fruit x 1; *d*, carpel x 2.

5. SÌDA L.

Ours low whitish scurfy-tomentose perennial herbs. Pedicels articulated. Involucel of 1 to 3 slender deciduous bractlets. Flowers cream-color. Carpels 1-seeded, indehiscent or splitting into 2 valves. Seeds pendulous. (Greek name used by Theophrastus for a species of Water-lily.)

1. **S. hederàcea** (Dougl.) Torr. ALKALI MALLOW. Fig. 628. Stems decumbent, more or less branching, ½ to 1 ft. long; leaves round-reniform or ovate, dentate or serrate, ¾

to 2 in. broad, on petioles ½ to 1 in. long; flowers pedicelled, axillary, solitary or in small clusters; petals ½ in. long; carpels 6 to 10, triangular, attached by a straight edge to the slender axis.—Subsaline soils in valleys, almost throughout Cal.; n. to Wash., e. to Tex. It is often a troublesome weed in orchards and is sometimes called White-weed on account of its whitish herbage. May-Sept.

6. MODÌOLA Moench

Low herb. Leaves rounded, coarsely crenate, palmately lobed or incised. Flowers small, solitary on axillary peduncles, subtended by 2 or 3 narrow bractlets. Corolla dull red. Fruit a somewhat depressed circle of 15 to 30 carpels with 2 seeds in each. Carpels reniform, septate between the seeds, tardily 2-valved from the top, at length deciduous from the axis. (Latin modiolus, relating to the wheel-like fruit.)

1. **M. caroliniàna** Don. Perennial; stems spreading, 6 to 18 in. long; leaves 1 to 1½ in. broad; petals 2 to 3 lines long; carpels hirsutulose.—Introd. from se. U. S.: Ferndale, Humboldt Co.; Auburn; Los Banos; Swift ranch, Madera Co.; Riverside.

7. SPHAERÁLCEA St. Hil.

Herbs or shrubs, ours mostly hoary-tomentose or canescent, with commonly roundish or angular leaves. Flowers commonly in racemes, the racemes often subpaniculate, sometimes corymbose, or often reduced to axillary fascicles. Bractlets present (in ours), slender or filiform. Carpels 5 or more, each 1 to 3-seeded, the fruit often dehiscent and 2-valved. Seeds (at least the lower) ascending. (Greek sphaera, a sphere, and alkea, mallow, the carpels commonly spherical.) MALVASTRUM Gray.

A. Carpels one-ovuled, one-seeded.—Subgenus MALVASTRUM.

Annuals; leaves orbicular.
- Petals rose-purple with crimson blotch at base; leaves crenate.....1. *S. rotundifolia.*
- Petals white or violet-purple, without blotch; leaves 5 to 7-lobed.
  - Flowers 2½ to 4 lines long; herbage stellate-pubescent.....2. *S. exilis.*
  - Flowers 6 to 12 lines long; herbage hirsute.....3. *S. parryi.*

Perennials.
- Calyx hirsute or villous; flowers in heads.
  - Heads terminal and usually solitary.....4. *S. palmeri.*
  - Heads numerous, sessile along the naked summit of branches...5. *S. densiflora.*
- Calyx densely stellate-pubescent, not hirsute; flowers in subpaniculate racemes.
  - Herbage covered with a dense white tomentum.
    - Flower-buds heavily invested in a dense wool, the calyx-lobes concealed in bud; corolla rose-pink; leaves pentagonal or roundish, cordate at base, the lobes roundish.....6. *S. fremontii.*
    - Flower-buds tomentulose, the calyx-lobes not concealed.
      - Corolla rose-color, aging yellow; flower-buds contracted at apex into a slender beak; leaves round-cordate.....7. *S. davidsonii.*
      - Corolla rose-color; flower-buds shortly acute, not beaked; leaves ovate, rugose.....8. *S. arcuata.*
  - Herbage finely stellate-canescent.
    - Flowers in rather close clusters, the clusters loosely disposed in a virgate raceme; corolla rose-pink; mainland.....9. *S. fasciculata.*
    - Flowers in a close panicle; corolla rose-purple; insular.....10. *S. nesiotica.*

B. Carpels 2 or 3-ovuled, 1 to 3-seeded; ours perennial.—Subgenus EUSPHAERALCEA.

Fruit depressed-globose; mature carpels usually one-seeded.
- Upper sterile portions of carpel minute and inconspicuous; flowers small but numerous, racemes from upper axils, corolla vermillion; plants large, robust; leaf-lobes very rounded.....11. *S. orcuttii.*
- Upper sterile portion of carpel thin, smooth and moderately incurved; inflorescence racemose, showy; calyx large, with long acuminate lobes; deserts.
  - Leaves crenate or shallowly lobed.
    - Flowers apricot-color.
      - Carpels reticulate-scarious on the sides opposite lower seed, canescent on back; stems glabrate to tomentose; common.....12. *S. ambigua.*
      - Carpels entirely smooth on sides, densely woolly on back; stems covered with a close white felt; local.....13. *S. pulchella.*
    - Flowers pink, drying violet-purple; local.....14. *S. purpurea.*
  - Leaves palmately parted or divided, with cleft or toothed lobes; rare.....15. *S. eremicola.*

Fruit little or not at all depressed; mature carpels 1 to 3-seeded; perennials.
Carpels canescent or glabrous on the back; leaves not maple-like, mostly rather small.
Leaves thick or thickish, rugose, somewhat oblong to linear; flowers few in the leaf axils, lavender; Colorado Desert.....16. *S. angustifolia.*
Leaves usually thin; flowers numerous in an elongated thyrsoid panicle.....17. *S. fendleri.*
Carpels covered on the back with long bristles, thus forming a somewhat bur-like fruit; flowers large, rose-color, sparse.
Calyx-lobes ovate, acuminate; leaves deeply 5-lobed, truncate or subcordate at base, 2½ to 6 in. long.....18. *S. acerifolia.*
Calyx-lobes round-ovate, abruptly acute; leaves typically cuneate-obovate, ¾ to 1 in. long.....19. *S. bakeri.*

1. **S. rotundifòlia** Jepson n. comb. Stem erect, branching, 4 to 16 (or 24) in. high; herbage hirsute; leaves few, orbicular-cordate, crenate, ½ to 2 in. wide, the petioles 1 to 3 in. long; bractlets filiform; flowers in terminal corymbs or corymbose racemes; petals rose-pink with a large red-purple spot below middle of petal, 9 to 13 lines long; carpels 35 to 45, very flat, narrow on the back, black, rugose-reticulate.—Washes and sandy mesas: Mohave Desert, n. to Inyo Co.; e. to Ariz. and Colo. (Malvastrum rotundifolium Gray.)

2. **S. éxilis** Jepson n. comb. Stems several from the base, diffuse or decumbent, 4 to 18 in. long; herbage stellate-pubescent; leaves palmately 3 to 5-cleft with dentate or incisely-toothed lobes, 3 to 5 lines wide; bractlets 3, slender; calyx-lobes ovate, acuminate; petals white or rose-color, obovate, 2½ to 4 lines long; anthers blue; carpels subreniform, transversely rugose.—Sandy washes and desert mesas: Colorado and Mohave deserts; spreading as a weed in the San Joaquin Valley and w. to the coast. (Malvastrum exile Gray.)

3. **S. párryi** Jepson n. comb. Similar to no. 2 but the flowers larger; herbage hirsute and often glandular; calyx-lobes ovate, the attenuate or subulate apex as long as the body; corolla rose-color or violet-purple, 6 to 12 lines long.—Upper San Joaquin Valley, its bordering foothills and w. to the Salinas River, 500 to 3000 ft.: Poso Creek; Caliente Creek; Buena Vista Hills; Alcalde; Paso Robles; Nacimiento River. (Malvastrum parryi Greene.)

4. **S. pálmeri** Jepson n. comb. Stems stout, herbaceous, markedly and equally leafy to the summit, 6 to 8 ft. high; leaves broadly or round-ovate, mostly 3-lobed, dentate, truncate or cordate at base, 1 to 2¼ in. long; stipules lanceolate, 4 to 6 lines long; flowers sessile in terminal clusters, subtended by conspicuous foliaceous bracts; bractlets linear, nearly equaling the calyx-lobes; calyx-lobes ovate, acuminate; petals light rose-color, 7 to 10 lines long.—Foothills bordering the Salinas Valley, 200 to 1000 ft. (Malvastrum palmeri Wats. **M. involucratum Rob.**)

5. **S. densiflòra** Jepson n. comb. Stems woody below, 2 to 3 ft. high; herbage finely stellate-tomentose; leaves orbicular-cordate, dentate, not lobed or commonly obscurely or evidently 3-lobed, 1 to 1¾ in. wide, the petioles 3 to 11 lines long; flowers in dense sessile heads (often appearing as if in whorls), forming an interrupted naked or leafy spike; bractlets conspicuous, filiform, densely hispid; calyx hirsute-stellate, often papery-white in age, its lobes lanceolate, acuminate; petals rose-red, 6 to 8 lines long.—Valleys and cañons, 1000 to 4100 ft., both e. and w. sides of the Cuyamaca and San Jacinto mountains, and n. to north slope of San Gabriel Mts.: El Nido; Alpine; Ramona; Menifee; Palm Cañon of San Jacinto; Rock Creek; Ravenna. (Malvastrum densiflorum Wats.)

6. **S. fremóntii** (Torr.) Jepson n. comb. Stems stout, woody at base, 2 to 5 ft. high; herbage densely white-tomentose; leaves very thick, orbicular-ovate, not lobed or shallowly 5 to 7-lobed, crenate, 1½ to 4 in. broad, on petioles ½ to 1 in. long; flower-clusters somewhat head-like or close, sessile in the axils or short-peduncled and thus interrupted-spicate at summit of stem; calyx globose-ovate in bud, conspicuously and very densely and closely woolly, only the subulate tips of the lobes visible, almost equaled by the 3 linear-setaceous bractlets of the involucre; corolla pale pink or rose-color, aging white-scarious, 7 to 8 lines long; carpels smooth, promptly dehiscent.—Foothills surrounding the Great Valley, 800 to 4000 ft.: Sierra Nevada

foothills from Tulare Co. to Amador Co.; Mt. Hamilton Range; Mt. Diablo; Yollo Bolly foothills. (Malvastrum fremontii Torr.) Var. CERCÓPHORUM (Rob.) Jepson n. comb. Calyx-lobes lanceolate-linear, caudate attenuate, nearly as long as the petals.—N. end of Mt. Hamilton Range. (Malvastrum fremontii var. cercophorum Rob.)

7. **S. davidsònii** Jepson n. comb. Stems erect, 2 to 3 ft. high; herbage finely stellate-tomentulose; leaves round-cordate, dentate, somewhat shallowly or obscurely lobed, ¾ to 2¾ in. long; flowers in short simple or forking racemes, the racemes peduncled or sessile in the leaf axils and thus forming an interrupted panicle; calyx-lobes ovate, attenuate into a subulate apex as long; petals rose-color, changing in age to yellow, 6 to 7 lines long; carpels glabrous on the back and sides, hairy-tufted and densely tomentulose at apex, 1-nerved on back.—San Gabriel Mts., 2000 to 3100 ft. (Malvastrum davidsonii Rob.)

8. **S. arcuàta** (Greene) Arthur. Stems woody below, 2 to 5 ft. high; herbage covered with a dense or felt-like white tomentum; leaves ovate to ovate-orbicular, dentate, slightly or not at all lobed, truncate at base, more or less rugose, becoming green above, ¾ to 2 in. long, on petioles ¼ to 1¼ in. long; flowers in dense or head-like clusters sessile in the upper axils and at the ends of the branches, forming long interrupted spikes; bractlets linear-filiform, equaling the rusty tomentose calyx; petals rose-color, 7 to 9 lines long; carpels tomentulose on back, at length glabrate.—Foothills, e. slope Santa Cruz Mts. and w. slope Mt. Hamilton Range. (Malvastrum arcuatum Rob.)

9. **S. fasciculàta** (Nutt.) Arthur. Stems 3 to 8 ft. high, woody below, with long slender wand-like branches; pubescence short and close; leaves round-ovate, dentate, not lobed or obscurely lobed or pentagonal, mostly truncate or subcordate at base, ¾ to 1¼ (or 2½) in. long; petioles 5 to 8 lines long; buds subacute; flowers in sessile or short-peduncled, often head-like, clusters, the clusters distant, or at least not crowded, but virgately racemose, the inflorescence often a little leafy below; calyx-lobes triangular-ovate, obtuse or with a very short point; petals rose-pink, unsymmetrical, 5 to 10 lines long; carpels smooth, promptly dehiscent.—Hill slopes, 500 to 5000 ft.: South Coast Ranges from Santa Lucia Mts. s.; coastal S. Cal. and e. to west side Colorado Desert. Var. LAXIFLÒRA Jepson n. comb. Clusters tending to lengthen or to be racemose, the inflorescence thus becoming more truly paniculate.—Santa Monica Mts.; San Bernardino Valley; Pacheco Pass. (Malvastrum thurberi var. laxiflorum Gray.)

10. **S. nesiótica** Jepson n. comb. Similar to no. 9; leaves round-ovate, cordate at base, 3-lobed, crenulate, green or greenish and sub-glabrous above, 1 to 1½ in. long; buds obtuse; flowers in a fastigiate leafless panicle.—Santa Cruz Isl. (Malvastrum nesioticum Rob.)

11. **S. orcútti** Rose. Stems erect, 1 or several from the base, 1¼ to 3 ft. high; herbage thinly stellate-puberulent or canescent; leaves ¾ to 2 in. long, ovate in outline, truncatish at base, the lateral angles toward the base commonly enlarged so that the blade is somewhat 3-lobed with flowing outline, the margin entire or nearly so; flowers in short racemes in the upper axils, the upper leaves mostly reduced and bracteate, the inflorescence thus interruptedly spicate; calyx 2 to 3 lines long; corolla bright terra-cotta or red, 3 to 4 lines long; carpels 1 line long, reniform in outline from the strong recurving of the empty scarious apex, thin-walled or subscarious, deeply reticulate on the sides, the areola often dark-colored; seed 1.—Colorado Desert: Carrizo Creek; Signal Mt.; Meloland.

S. CÓULTERI Gray. Slender annual; flowers small, orange, clustered in the axils of the upper leaves.—Sw. Ariz.; to be looked for near Ft. Yuma.

12. **S. ambígua** Gray. APRICOT MALLOW. Stems several or many from the base, usually unbranched or simple above, erect or spreading, forming roundish clusters 1 to 4 ft. broad; herbage finely but densely stellate-puberulent; leaves 1 to 2½ in. long, mostly as broad as long, cordate to round-ovate

crenate, scarcely or not at all lobed to strongly 3-lobed or somewhat 5-lobed; calyx 3 to 4 lines long, usually shorter than the fruit; bractlets filiform, hardly longer than calyx-tube; petals rose-red to brick-red, notched at apex, 5 to 10 lines long, the claws with a dense ciliate tuft of hairs on each side at base; anthers purple; stigmas black or purple; sides of carpels glabrous, smooth-chartaceous opposite the upper seed, reticulate-scarious opposite the lower seed, canescent on the back.—Desert slopes and desert ranges, 2000 to 6000 ft.: Cuyamaca, San Jacinto and San Bernardino mountains; Colorado and Mohave deserts; n. to Inyo Co.; e. to Ariz.

13. **S. pulchélla** Jepson n. sp. Stems erect from a woody root-crown, making a bushy plant 2 to 3 ft. high, covered with a close white felt; leaves roundish-cordate in outline, dentate, not lobed or somewhat 3 or 5-lobed, stellate-canescent, soon green above, ½ to 1 in. long, on petioles ½ to 1½ in. long; flowers in a loose narrow panicle; calyx rusty-puberulent, its tube 1¾ to 2 lines long (about as long as the carpels), the lobes ovate-lanceolate, 4 to 5 lines long; petals deep apricot-color, ¾ to 1 in. long; ovary covered with a dense white felt; carpels smooth on sides, densely woolly on back.—Panamint Range, Inyo Co. (Hanaupah Cañon, 4000 ft., Jepson 7064, type).

14. **S. purpúrea** Parish. Similar to no. 11; stems clothed with a close, fine whitish felt.—Sw. Colorado Desert: Mountain Spr., San Diego Co.; Coyote Well. (S. violacea M. & J.)

15. **S. eremicòla** Jepson n. sp. Stems slender, erect or ascending, several from the thick root-crown, 12 to 17 in. high, green and glabrous or nearly so; leaves roundish-cordate in outline, 4 to 11 lines long, 3 to 5-parted with the lobes again cleft and toothed, thinly stellate-puberulent, green; flowers few in a loose and narrow nearly naked panicle; calyx woolly, its tube 1½ to 2 lines long, almost as long as the fruit, the lobes lanceolate, acuminate, 4 to 5 lines long; bractlets filiform, about as long as the tube; petals apricot-color, 7 to 8 lines long; ovules 2; sides of carpels smooth.—Panamint Mts. (Emigrant Cañon, 4200 ft., Jepson 7120, type).

16. **S. angustifòlia** Don var. **cuspidàta** Gray. Stems many from the base, 3 to 4 ft. high; herbage finely puberulent, the older stems and upper side of leaves glabrate; leaves oblong- to linear-lanceolate, sometimes with 1 more or less obscure lobe at the base angle on each side, minutely crenulate, ¾ to 3 in. long; flowers in few-flowered clusters in the axils of the upper leaves; calyx-lobes ovate, acuminate; corolla saffron-red, 4 to 6 lines long; carpels glabrous on the sides, the sides smooth above, reticulate below.—Colorado Desert, rare; e. to Ariz. and Col.

17. **S. féndleri** Gray var. **califórnica** Parish. Stems several from the base, woody below, forming an erect shrub 2 to 4 ft. high; herbage glabrate or minutely stellate-flocculent; leaves 1 to 3½ in. long, 3-lobed, with sharply acute sinuses, the lateral lobes small, the central one ovate to oblong and 3 to 5 times as long as the lateral, the margin irregularly crenate; flowers in clusters in the axils of the reduced upper leaves, or the inflorescence becoming a somewhat spicate panicle; petals salmon-red, 3½ to 5 lines long; carpels smooth on sides opposite upper seeds, finely reticulate opposite lower seed, finely puberulent or glabrate on back.—Mesas and washes, 25 to 1500 ft.: San Bernardino Valley; Conchilla Desert.

18. **S. acerifòlia** Nutt. Stems erect, 2 to 3 ft. high; herbage green, finely puberulent; leaves maple-like, deeply 5-lobed (the lobes acute, irregularly serrate), truncate or subcordate at base, 2 to 6½ in. long; petioles ½ to 3¼ in. long; flower-clusters sessile or nearly so in the upper axils and thus interruptedly spicate at the summit of the branches; calyx-lobes ovate, acuminate, shorter than the mature carpels; petals rose-color, ¾ to 1 in. long; back of carpels densely puberulent and also conspicuously covered with long ascending bristles.—Cañons, n. Humboldt Co. (Bald Mt.; Three Creeks); n. to Wash.

19. **S. bàkeri** Jepson n. sp. Stems erect, several from the root-crown, 1 to 1¼ ft. high; herbage finely puberulent; leaves 3 to 12 lines long, the lower sub-orbicular, truncatish at base, crenately lobed and crenate, the upper

leaves often cuneate-obovate in outline, irregularly serrate on upper half or somewhat 3 lobed, ¾ to 1 in. long; flowers mostly solitary in the upper axils, on peduncles 2 to 7 lines long; calyx-lobes round-ovate, abruptly acute; petals rose-pink, ¾ in. long; carpels closely puberulent and also densely covered with long ascending dull-white bristles.—Lava beds on the boundary of Shasta and Modoc Cos. (Fall River Valley, M. S. Baker, type).

8. **HORSFÓRDIA** Gray

Woody plants, the herbage yellowish or greenish-yellow, covered with a dense felt. Leaves ovate-lanceolate, cordate at base, leathery, subentire or irregularly erosulate. Flowers 1 to 3 in the axils, peduncled. Bractlets none. Corolla salmon-color. Carpels 3-ovuled, 1 to 3-seeded, at maturity 2-valved above, the valves spreading, scarious and wing-like, 3 to 4 times as long as the lower seed-bearing portion which is firm and reticulate. (F. H. Horsford of Vermont, botanical collector.)

1. **H. newbérryi** (Wats.) Gray. Stems erect, 5 to 8 ft. high, with lateral branches on upper ⅔; stems and petioles yellow stellate-tomentose, the leaves with a somewhat paler or greenish-yellow but very dense and fine stellate-tomentum; leaves 1¼ to 2¾ in. long, on petioles ¼ to 1¼ in. long; petals orbicular, rotate, 3 lines long; stamen-tube with simple spreading non-glandular hairs; anthers yellow; stigmas yellow; fruit 4 lines long, the wings ovate.—Sw. Colorado Desert: Palm Cañon of San Isidro; Carrizo Mt.; Signal Mt.; e. to Ariz., s. to Mex.

STERCULIÀCEAE. Sterculia Family

Shrubs or trees with alternate leaves and perfect regular or nearly regular 5-merous flowers. Stamens united below into a tube. Ovary superior, 5 (or 4)-celled. Style in ours one, stigmatic at apex. Fruit a capsule.

Flowers yellow, showy; petals none; calyx-lobes with a conspicuous gland at base; ovary not stiped ..... 1. Fremontia.
Flowers brownish, minute; petal claws filiform, ending in a hood; calyx glands none; ovary stipitate ..... 2. Ayenia.

1. **FREMÓNTIA** Torr.

Evergreen shrub with small often lobed leaves and stellate pubescence. Flowers showy, short-pediceled, solitary and axillary on the branchlets. Stipules caducous. Bractlets 3 to 5, small. Calyx yellow and corolla-like, deeply 5-cleft into round-ovate lobes or sepals; these imbricated in the bud, the 3 inner a little larger, all with a rounded and sharply defined glandular area at base. Corolla none. Stamens 5; filaments united to the middle. Capsule 4 or 5-celled, loculicidally dehiscent. (General John C. Fremont, Pathfinder of the Rocky Mts. and Sierra Nevada, and first United States Senator from California, who discovered it.)

629 Fremontia californica Torr.; fl. branchlet x 1.

1. **F. califórnica** Torr. Flannel Bush. Fig. 629. Loosely branching shrub 6 to 10 ft. high, sometimes a small tree up to 18 ft. high; branches tough and flexible, with many short leaf- and flower-bearing branchlets or spurs; leaves green above, covered beneath with a dense gray or whitish felt, ¼ to 1 in. long, or on sterile shoots somewhat larger; petioles short; calyx somewhat flannel-like, 1½ to 2 in. broad, persistent, the lobes

commonly mucronate; gland hairy; capsule ovate, covered with a dense brown felt and short bristly hairs, ¾ to 1⅛ in. long, persistent.—Mountain slopes, 1500 to 5300 ft.: Sierra Nevada (Tehama Co. foothills, rare; Mariposa Co. to Kern Co., abundant); Coast Ranges from Lake Co. to San Luis Obispo Co., rare or localized; S. Cal. (n. slope San Gabriel and San Bernardino mountains, common, and s. to San Diego Co., rare). Var. MEXICÀNA Jepson n. comb. Gland of the calyx not hairy.—Sonoma Co. to Mt. Pinos and San Gabriel Mts.; s. to Mex. (Fremontodendron mexicanum Dav.)

2. **AYÈNIA** Loefl.

Small shrubby plants with small flowers. Calyx 5-parted. Petals with a long filamentous claw ending in a hood; hoods inflexed, adnate to the stamen-column and covering the anthers. Fertile stamens 5, these alternate with 5 truncate staminodia at summit of stamen-tube; anthers with 3 parallel cells. Ovary on a stipe, 5-celled, 2 ovules in each cell. Capsule globose, muricate, splitting septicidally into 5 one-seeded carpels which separate from a central column; carpels loculicidally 2-valved. Seeds strongly rugose; endosperm none. (Named for the Duc d'Ayen.)

1. **A. califórnica** Jepson n. sp. Stems several from the base, minutely canescent, woody below, ½ to 1 ft. high; leaves ovate to oblong-ovate, serrate, 3 to 6 lines long, the petioles ½ to 3 lines long; flowers 1 to 1¼ lines long, brownish; capsule 1¾ lines long.—Mts. on w. side of Colorado Desert (Palm Cañon of San Jacinto, Jepson 1407, type).

HYPERICÀCEAE. St. John's Wort Family

Ours herbs or slightly suffrutescent plants. Leaves opposite, entire, without stipules and with pellucid dots or dark glands. Flowers perfect, regular and hypogynous. Sepals 5 (in ours) or 4, herbaceous, persistent. Petals 5 (in ours) or 4, yellow (in ours). Stamens usually numerous, distinct or more or less united into 3 to 5 clusters. Ovary superior, 1 or 3-celled; styles in ours 3. Fruit a septicidal capsule. Seed without endosperm.

1. **HYPÉRICUM** L. St. John's Wort

Leaves sessile. Flowers in terminal cymes, rarely solitary. Petals deciduous or marcescent. (Ancient Greek name.)

Annuals; sepals longer than the petals; styles short; capsule 1-celled.
  Erect from the base, more or less branching; stamens 6 to 12.....1. *H. mutilum.*
  Procumbent, forming mats with ascending or erect branches; stamens 15 to 21.....
    2. *H. anagalloides.*
Perennials; petals much longer than the sepals; styles long, divaricately spreading; capsule 3-celled; stamens very numerous.
  Stems tall, few, from rootstock; leaves not folded.
    Stems with numerous short sterile shoots; sepals lanceolate; capsule not lobed..
      3. *H. perforatum.*
    Stems destitute of sterile shoots; sepals ovate; capsule 3-lobed..4. *H. formosum.*
  Stems low, numerous, from a woody crown; leaves commonly conduplicate; capsule 3-lobed.....5. *H. concinnum.*

1. **H. mùtilum** L. Stem mostly simple below and branching above, 10 to 17 in. high; leaves ovate, 5 to 10 lines long, 3 to 6 lines broad, 5-nerved at base, sessile; flowers in leafy cymes at the ends of the branches; stamens 6 to 12; sepals linear to lanceolate, mostly shorter than the capsule.—Shores of the lower Sacramento and lower San Joaquin rivers. Aug.-Sept.

2. **H. anagalloìdes** C. & S. Tinkers Penny. Fig. 630. Commonly forming dense mats 6 to 15 in. broad, with ascending or erect branches 2 to 5 (or 7) in. high; leaves lanceolate to ovate or orbicular, obtuse, 5 to 7-nerved at base, 2 to 6 (or 9) lines long; flowers 1 to 1½ lines long, borne 1 to 3 in a leafy cyme, or the cyme becoming paniculate; petals salmon-color; sepals ovate or linear-oblong, unequal, longer than the capsule; stamens 15 to 21.—Springy places and streamlets in the hills and mountains, almost throughout Cal., 500 to 6000 ft., common northward; very variable in size, branching and foliage.

630. Hypericum anagalloides C. & S.; *a*, habit x ¾; *b*, fl. x 2; *c*, capsule x 3.

3. **H. perforàtum** L. KLAMATH WEED. Stems simple but the main axis bearing many very leafy short sterile shoots and ending above in a densely flowered cyme, 2 (or 1) ft. high; leaves linear to oblong, soon revolute, ½ to 1 in. long, those of the sterile shoots about ½ in. long; flowers about 1 in. broad; sepals lanceolate, acuminate, about 4 times as long as broad; petals linear-oblong, copiously black-dotted, twisting after anthesis.—European weed, becoming a pest in abandoned or poorly tilled fields in the hill country in n. Cal., 500 to 2300 ft.: Tuolumne and Mendocino Cos. to Siskiyou Co.

4. **H. formòsum** H.B.K. var. **scóuleri** Coulter. Stems from running root-stocks, slender, simple or branching at summit, 1 to 3 ft. high; leaves ovate to oval or oblong, obtuse, black-dotted along the margins, sessile by a more or less clasping base, ½ to 1¼ in. long; flowers ½ to ¾ in. broad, in more or less panicled cymes; sepals and petals black-dotted; sepals ovate, mostly obtuse, sometimes acute, twice as long as broad; petals obovate; stamens numerous, in 3 clusters.—Hills and mountains, almost throughout Cal., 500 to 6000 ft.

5. **H. concínnum** Benth. GOLD-WIRE. Fig. 631. Stems wiry, numerous from the woody crown, forming a bushy plant 6 to 11 in. high; leaves thickish, linear to lanceolate, acute, inserted by a narrow base, usually folded, scantily black-dotted, ¾ to 1¾ in. long; flowers ⅞ to 1⅛ in. broad, in rather close clusters at summit of the stem; sepals ovate, somewhat abruptly short-pointed; petals obovate, black-dotted on the margin; stamens numerous, 4 of the filaments in each of the 3 clusters distinctly united at base, the others free.—Dry bushy mountain slopes and ridges, 500 to 3000 ft.: North Coast Ranges; Sierra Nevada from Mariposa Co. to Butte Co. June-July.

631. Hypericum concinnum Benth.; *a*, fl. stem x ¾; *b*, pistil x 2½; *c*, cross sect. of ovary x 6; *d*, capsule x 2.

ELATINÀCEAE. WATER-WORT FAMILY

Small annuals with opposite leaves and membranous stipules between them. Flowers 2 to 5-merous, small, perfect, symmetrical, solitary in the axils. Sepals, petals and stamens all distinct and hypogynous. Ovary with as many cells as there are sepals; styles distinct. Capsule 2 to 5-celled, septicidal or the partitions more or less persisting with the axis; placentae central.

Flower-parts 2 to 4; sepals obtuse, without midrib.....1. ELATINE.
Flower-parts 5; sepals pointed or acute, with thickened midrib and scarious margins....
2. BERGIA.

1. ELÁTINE L. WATER-WORT

Glabrous dwarfs, somewhat succulent, growing in water or in wet places, rooting at the nodes. Leaves entire. Flowers 2 to 4-merous. Sepals submembranous, obtuse. Petals white or whitish. Capsule globose, thin-membranous, 2 to 4-celled, several- or many-seeded. Seeds striately and regularly reticulated. (Greek, etymology obscure.)

Flowers sessile; flower-parts 3 or 2; seeds straight or nearly so.
Flower-parts mostly 2; petals equal.....1. *E. americana.*
Flower-parts mostly 3; petals unequal.....2. *E. brachysperma.*
Flowers pediceled; flower-parts 4; seeds strongly curved.....3. *E. californica.*

1. **E. americàna** Arn. Stems ¾ to 1½ in. long, often fistulous; leaves obovate, 1 to 1½ lines long; flowers mostly 2-merous; capsule valvate-dehiscent; seed with 9 or 10 rows of areoles, 20 to 30 areoles in a row.—Shallow water, San Bernardino Mts., exceedingly rare; Ore. and B. C. to Ont. and Tex.

2. **E. brachyspérma** Gray. MUD PURSLANE. Plants forming little mats (2 to 3 in. across) in wet places or late vernal beds of winter pools; leaves oblong or narrowly ovate, narrowed at base, 1 to 2 lines long; flowers sessile, mostly 2-merous; sepals commonly unequal, 3 (or 2); petals 3, pink, roundish obovate, commonly unequal; stamens 3 to 6; capsule valvate-dehiscent or bursting irregularly; seed with about 8 longitudinal rows of areoles, about 11 or 12 areoles in a row.—Mostly terrestrial, Coast Ranges and s. to S. Cal., mostly toward the coast; occasional. May.

3. **E. califórnica** Gray. Thickly branched, forming a dense mat ½ to 1½ in. across; leaves obovate or oblanceolate, the lower ones petioled; flowers on short pedicels; sepals 4, oblong, equal; petals 4, obovate, equal; stamens 8; seeds curved into a partial ring, with about 10 longitudinal rows of areoles and about 25 areoles in each row.—Montane: San Diego Co.; Sierra Nevada; n. to Wash.; rare.

2. BÉRGIA L.

Stems glandular-pubescent. Flowers pediceled and often fascicled, 5-merous. Sepals abruptly cuspidate, with strong midrib and scarious margins. Petals oblong. Capsule globose, with a coriaceous wall. (Dr. P. J. Bergius, Swedish naturalist of the 18th century.)

1. **B. texàna** Seubert. Stems diffusely branched, 6 to 12 in. high; leaves obovate or oblanceolate, tapering at base, serrulate at apex, ½ to 1¼ in. long; sepals 2 lines long, denticulate on the midrib and serrulate on the margin towards the apex, equaling or exceeding the whitish obovoid petals; stamens 5 or 10.—Sacramento; Merced; Elsinore; rarely seen; e. to Tex. and Mo.

FRANKENIÀCEAE. FRANKENIA FAMILY

Low perennial herbs or dwarf bushes with opposite entire leaves. Flowers perfect. Ovary superior, 1-celled, with parietal placentae. Seeds with a straight embryo.

1. FRANKÈNIA L.

Leaves small, crowded and fascicled in the axils. Flowers sessile, solitary, or by the reduction of the upper leaves to bracts becoming somewhat cymose. Calyx tubular, furrowed or almost prismatic, 4 or 5-toothed. Petals 4 or 5, appendaged at the very base of the blade, the appendage decurrent on the claw. Stamens in ours 4 to 7, hypogynous, exserted from the calyx-tube. Style 2 or 3-cleft, included. Capsule linear, angled, included in the persistent calyx, 2 to 4-valved, the seeds attached by filiform funiculi to the side of the cell. (Johann Franke, 1590-1661, Professor at Upsala, the first author who treated of Swedish plants.)

Style 3-cleft; ovules many; herbaceous or nearly so; common.....1. *F. grandifolia.*
Style 2-cleft; ovules 2 or 3; dwarf bush; San Diego.....2. *F. palmeri.*

1. **F. grandifòlia** C. & S. ALKALI-HEATH. Fig. 632. Erect or diffuse, often slightly woody at base, 6 to 13 in. high, glabrous or somewhat pubescent or short-hirsute, particularly at the nodes; leaves obovate to linear-oblanceolate, 3 to 5 lines long, with revolute margins, sessile or short-petiolate, the opposite pair mostly united by a somewhat membranaceous sheathing base; calyx 3 lines long, narrow-cylindrical, with acute teeth; petals slightly irregular, pinkish, exserted 1¼ to 2 lines, with oblong or obovate blade erose at summit; stamens 4 to 7; seeds numerous. — Common along the sea-shore and in salt-marshes: Marin Co. to San Diego and L. Cal. June-Oct. Also called Yerba Reuma by Spanish-Californians. Var. CAMPÉSTRIS Gray. Tufted, 4 to 20 in. high; leaves mostly linear-spatulate to oblanceolate, strongly revolute-margined, 2 to 4 lines long; petals less exserted (¾ to 1 line). — Interior alkaline plains, Great Valley to S. Cal. and e. to Inyo Co.

632. Frankenia grandifolia C. & S.; *a*, fl. branchlet x 1; *b*, petal x 4; *c*, pistil x 4.

2. **F. pálmeri** Wats. YERBA REUMA. Dwarf spreading bush 5 to 7 in. high, the branchlets thickly clothed with leaves; leaves linear-oblong, thick and strongly revolute so as to be nearly terete, canescent, 1 to 2 (or 2½) lines long; calyx 1½ lines long; petals whitish, the blade oblong; stamens 4. — Coast at San Diego and s. to L. Cal.

TAMARICÀCEAE. TAMARISK FAMILY

Shrubs or low trees, inhabitants of alkaline soils, with long slender branches bearing numerous minute appressed leaves. Flowers minute, numerous, in long clusters at the ends of the branches. Sepals 4 or 5. Petals 4 or 5, these and stamens (as many or twice as many) borne on a fleshy disk. Ovary superior, 1-celled, the placenta basal; styles 3 to 5. Fruit a capsule; seeds numerous, usually with a tuft of hairs at one end.

1. TÁMARIX L. TAMARISK

Our only genus. (Tamaris, a river in Spain.)

1. **T. gállica** L. FRENCH TAMARISK. Densely branched shrub 3 to 8 ft. high and often twice as broad; leaves ½ to ¾ line long; stamens 4 or 5. — Cult. from Eur., an escape along summer beds of winter flood streams: Sulphur Creek, sw. Colusa Co.; White Sulphur Creek, Napa Valley; Cache Creek, Tehachapi Pass; Furnace Creek, Death Valley; Salton Sink.

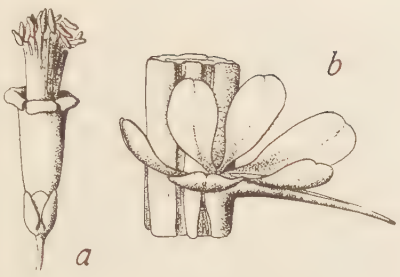
FOUQUIERIÀCEAE. CANDLEWOOD FAMILY

Heavily armed shrubs, leafless in the drought periods between the rains. Primary leaves of the season's shoots soon deciduous but developing their petioles into stout spines, the ordinary leaves borne on short spurs in the axils of the spines. Flowers showy, perfect, in terminal panicles. Sepals 5, unequal, imbricated. Corolla tubular, shortly 5-lobed. Stamens 10 to 17; filaments with a firm or red portion at base, this portion puberulent on back and developed at apex into a tooth or short ligule on the inside. Ovary superior; placentae parietal, lamellate, intruded in cavity and partly united at base so as to make an incompletely 3-celled ovary; ovules 4 to 6 on each placenta; styles 3, united to the middle. Fruit a capsule.

1. **FOUQUIÉRIA** HBK. Coach-whip.

The only genus. (P. E. Fouquier, professor of medicine at Paris.)

1. **F. splèndens** Engelm. Ocotillo. Fig. 633. Stems mostly simple, 8 to 25 ft. high, in clusters from a common root-crown; bark whitish, deeply furrowed between the decurrent bases of the slender but rigid spreading thorns; leaves fleshy, obovate, rounded at apex, 5 to 10 lines long, forming axillary rosettes on old wood; panicles racemose, dense, 4 to 10 in. long; flowers scarlet, ¾ to 1 in. long; sepals roundish, 2 to 3 lines broad; corolla-lobes recurving; stamens 15 to 17, exserted; capsule 8 lines long, 3-valved; seeds with a long fringe of hairs.—Desert mesas, Colorado Desert; e. to Tex., s. to Mex.



633. Fouquieria splendens Engelm.; *a*, fl. x 1; *b*, leaf rosette in axil of a thorn x 1.

CISTÀCEAE. Rock-rose Family

Low shrubs but ours herb-like or woody only at base. Flowers complete, regular, hypogynous. Sepals 5, persistent (2 smaller, wholly on the outside and bract-like). Petals 5, ephemeral. Stamens indefinite. Ovary superior, 1-celled with 3 parietal placentae; style one; ovules orthotropus on slender funiculi. Capsule 3-valved.

1. HELIÁNTHEMUM Pers.

Leaves alternate, simple, entire. Flowers yellow, opening but once. Stamens usually numerous, with filiform filaments and short anthers. Style very short or none; stigma capitate, 3-lobed. Capsule 1-celled or nearly 3-celled by the intrusion of the placentae. (Greek helios, sun, and anthemon, blossom.)

Flowers in a panicle or raceme; herbage pubescent or glabrate..... 1. *H. scoparium.*
Flowers corymbose; herbage woolly; Santa Cruz Isl.....2. *H. greenei.*

634. Helianthemum scoparium Nutt.; *a*, fl. branchlet x ¾; *b*, pistil x 7½; *c*, long. sect. of pistil x 7½.

1. **H. scopárium** Nutt. Rush-Rose. Fig. 634. Stems numerous, tufted, erect, very leafy, 8 to 20 in. high, arising from a much-branched woody crown and ending above in a small leafy panicle or short raceme; herbage and calyx minutely stellate-pubescent or glabrate; leaves narrowly linear, ¾ to 1¼ in. long, early deciduous; inner sepals 2 to 3 lines long, the two outer minute; corolla 5 to 7 lines broad; petals obovate; stamens 17 to 21; placentae partition-like; embryo slender and much coiled.—Along the coast, Mendocino Co. to Monterey Co. Apr.-May. Var. vulgàre Jepson n. var. Stems rush-like, the leaves sparse or early deciduous; calyx usually smaller; raceme or panicle naked.—Dry sunny slopes and ridges of the chaparral belt, 1500 to 4000 ft.: Coast Ranges from Lake Co. to San Luis Obispo Co. and

s. to San Diego Co.; Sierra Nevada from Eldorado Co. to Mariposa Co. (Coulterville, Jepson, type.)

2. **H. greénei** Rob. Stems from a woody base, branching, 6 to 10 in. high; young parts white-woolly; leaves linear, 1 to 1¼ lines broad; flowers on short (1 to 2 lines) pedicels in a somewhat condensed corymbose panicle; outer sepals linear or lanceolate, ½ to as long as the ovate acuminate inner ones.—Santa Cruz Isl.

RESEDÀCEAE. Mignonette Family

Herbs with simple alternate leaves. Flowers perfect, irregular, in racemes or spikes, ours inconspicuous. Sepals 4 to 7. Petals 2 to 6. Stamens 3 to 40, always more numerous than the petals, borne on one side of the flower. Ovary superior, 1-celled, with parietal placentae, opening at the top before the seeds are full grown. Stigmas 2 to 6, sessile, minute.

1. OLIGOMÉRIS Cambess.

Low branching somewhat succulent herb. Leaves linear, entire. Flowers white, in terminal spikes. Sepals 4 Petals (2) and stamens (in ours 3) inserted on the upper side of the flower. Capsule depressed, 4-lobed (each lobe sulcate on the back), opening at the summit. (Greek oligos, little, and meris, parts.)

1. **O. linifòlia** (Vahl) Mebr. Erect, branching from the base, ¾ to 2 ft. high; leaves ½ to 1⅜ in. long; flowers 1 line long; petals oblong, acute; capsules 1½ lines broad.—Colorado Desert; e. to Tex., s. to Mex.

Resèda L. Mignonette. Annual herbs; flowers in racemes; sepals 4 to 8; petals 4 to 7, laciniate; stamens 8 to 40, inserted on a disk on one side of the flower; capsule 3 to 6-lobed, horned. 1. R. odoràta L. Leaves mostly entire; petals deeply 5 to 8-cleft.—Garden escape in Marin Co. 2. R. lùtea L. Leaves divided; petals greenish-yellow, all cleft but 1 or 2.—Garden escape about Los Angeles. 3. R. álba L. Leaves pinnatifid; petals all 3-cleft at summit.—Occasional garden escape.

VIOLÀCEAE. Violet Family

Perennial herbs with alternate stipulate leaves and complete flowers. Sepals 5, persistent. Corolla irregular, consisting of 5 somewhat unequal petals, 2 upper, 2 lateral and 1 lower, the lower spurred at base. Stamens 5, with short and broad filaments bearing the anthers on their inner face and connivent over the ovary. Ovary superior, 1-celled, maturing into a 3-valved capsule with valves placenta-bearing along the middle. Style and stigma one. Seeds rather large, with a hard coat and straight embryo in fleshy endosperm.

1. VIÒLA L. Violet

Peduncles axillary, 1-flowered. Stipules persistent. Sepals unequal, produced below the point of insertion into auricles, persistent. Stamens with broad connectives which are prolonged beyond the anthers, the two lower bearing wings which project into the spur of the corolla. The valves of the capsule bear the seeds along the middle, and after dehiscence fold together firmly lengthwise and eject the seeds with violence. (Old Latin name used by Virgil.)

A. Leaves divided or parted (merely toothed in one var. of no. 5).

Upper petals deep blue or purple; lateral petals with a bearded spot.
- Leaves puberulent (sometimes glabrous); lateral and lower petals bluish or white with yellowish base.....1. *V. beckwithii.*
- Leaves glabrous; lateral and lower petals yellow or cream-color.....2. *V. hallii.*

Petals all yellow or purplish or brownish externally or purple-veined; lateral petals with or without beard.
- Leaves pinnately twice-parted into narrow segments; petals orange-yellow, the 3 lower purple-veined, the others brownish externally.....3. *V. douglasii.*
- Leaves palmately cleft or divided.
  - Stems mostly below ground, the peduncles mostly basal or scape-like; petals pale yellow.....4. *V. sheltonii.*
  - Stems 4 to 14 in. high, naked below the leafy summit which bears the axillary peduncles; petals yellow, purple externally.....5. *V. lobata*

B. Leaves undivided.

Flowers yellow (blue or purple in one var. of no. 7).
Stems prostrate, stolon-like; leaves round-cordate, rounded at apex; Redwood belt... 6. *V. sarmentosa.*
Stems erect.
Leaves mostly elongate.
Leaves ovate to lanceolate, mostly abruptly cuneate at base; petioles not margined; herbage pubescent.
Peduncles usually surpassing the leaves; capsule puberulent; leaves commonly dentate, mostly ¾ to 1¼ in. long..7. *V. purpurea.*
Peduncles usually not surpassing the leaves; capsule glabrous; leaves entire or subentire, mostly 1½ to 3 in. long...8. *V. nuttallii.*
Leaves oblong-lanceolate to ovate, attenuate at base into the petiole; petioles margined; herbage usually glabrous; capsule puberulent..... 9. *V. praemorsa.*
Leaves not elongate.
Peduncles 1½ in. long; corolla bright yellow, more or less purple-veined; leaves thin; wet woods.....10. *V. glabella.*
Peduncles 4 to 5 in. long; corolla golden yellow with brown-purple lines at base; leaves thickish; open hills.....11. *V. pedunculata.*
Flowers not yellow (or with some other color predominating).
Stems erect, bearing leaves and peduncles, and arising from short or creeping rootstocks; (stems in no. 14 at first very short; compare also no. 16).
Lateral petals with a purple spot or blotch at base; stems mostly naked below, leafy above, 3 to 12 in. high; stipules entire.
Leaves mostly cordate at base; stipules membranous.....12. *V. ocellata.*
Leaves mostly truncatish or subcuneate at base; stipules submembranous... 13. *V. cuneata.*
Petals not spotted, blue or violet, rarely white.
Stems (at least at first) very short (mostly ½ to 1 in. long) or almost none; herbage puberulent; stipules herbaceous, lacerate or toothed; common.....14. *V. adunca.*
Stems 5 to 8 in. high; herbage glabrous; stipules entire or almost entire; rare.....15. *V. howellii.*
Peduncles scape-like, these and the leaves arising directly from rootstocks or stolons; herbage glabrous.
Leaves cordate.
Petals blue or violet-purple; leaves commonly 1 to 2 in. wide; rare species in Cal.
Rootstock thick.
Rootstock sending off short leafy stolons above ground; lower petals with a bearded spot at base; north coastal..... 16. *V. langsdorffii.*
Rootstocks thick and rather short, creeping underground, never sending off runners or stolons; lower petals hairy at base, the others more or less so; montane..... 17. *V. nephrophylla.*
Rootstock filiform; petals pale violet or whitish, the lateral ones with a sparsely bearded spot or beardless; Del Norte Co..... 18. *V. palustris.*
Petals white, commonly beardless; rootstock filiform; leaves ½ to 1 in. wide; montane, common.....19. *V. blanda.*
Leaves narrow-ovate to rhomboid-elliptic, not cordate; rootstock thickish; petals white, the lateral with a bearded spot; Del Norte Co., rare..... 20. *V. occidentalis.*

1. **V. beckwithii** T. & G. Plants 2 to 4 in. high, the cluster of slender stems mainly below ground, arising from a short and usually deep rootstock; herbage puberulent or sometimes nearly glabrous; leaves palmately about 3 times 3-parted into linear or spatulate-linear segments, the segments mostly obtuse or sometimes mucronulate; primary divisions more or less petiolulate; peduncles scape-like; petals 4 to 7 lines long, the upper deep purple, the others white or light blue and purple-veined, with a yellowish base; spur short-saccate; stigma beakless, with a tuft of spreading or reflexed bristles on each side.—Moist gravelly soil, 3000 to 5000 ft.: Sierra Nevada from Nevada Co. to Siskiyou and Modoc Cos.; Nev. to Ore. May-July.

2. **V. hállii** Gray. Habit of no. 1; herbage glabrous; leaves ovate or oblong and irregular in outline, subpinnately or palmately twice parted into lanceolate or linear segments, the segments callous-apiculate; petals 3 to 6 lines long, strongly 2-colored, the upper deep blue or dark purple, the others yellow or white, purple-veined at base, the lateral with a bearded spot on claw; stigma beakless, bearded below its margin.—Montane, gravelly soil, 2500 to 6600 ft.: Mendocino, Humboldt and Trinity Cos.; n. to Ore.

3. **V. douglásii** Steud. Plants 2 to 5 in. high, the cluster of stems wholly or almost completely underground, arising from a deep short rootstock;

635. Viola lobata Benth.; *a*, habit x ½; *b*, capsule with divergent valves x 1.

Montane, rocky places or in woods, 3000 to 6300 ft.: Calaveras Co. to Plumas Co.; Lake and Colusa Cos. to Siskiyou Co.; n. to Wash.

5. **V. lobàta** Benth. PINE VIOLET. Fig. 635. Stem erect, naked below the leafy summit, 4 to 14 in. high; rootstock short, deep-seated; leaves 1 to 3 in. long, ovate or almost round in outline, cordate or truncate at base, palmately 3 to 7-cleft or -divided, the lobes entire or somewhat repandly toothed, and the lateral usually larger; inflorescence somewhat umbellate; peduncles 1 to 2 in. long; petals yellow, all dark-veined towards base, purple on the outside.—Woods, 2000 to 6000 ft.: Cuyamaca Mts.; Sierra Nevada from Tulare Co. to Siskiyou Co.; North Coast Ranges. Mar.-May. Var. INTEGRIFÒLIA Wats. Leaves crenate or with a few coarse teeth, but not at all lobed.—Cuyamaca Mts.; Howell Mt. to Mt. Shasta; s. Ore. June.

6. **V. sarmentòsa**. Dougl. WOOD VIOLET. Stems prostrate, stolon-like, sparsely leafy; peduncles commonly longer than the leaves, at first scape-like and arising from the cluster crowning the stipular-scaly rootstock; leaves bipinnatifid with long linear or oblong segments; stipules lanceolate, entire or incised; flowers usually large, on peduncles (2 to 3 in. long) equaling or exceeding the leaves; petals 6 to 8 lines long, orange-yellow, the two upper brownish-purple externally, the others purple-veined; capsule 3 to 4 lines long, acute.—Open hills, 100 to 4000 ft., Coast Ranges from Siskiyou Co. to the Mt. Hamilton Range and s. to San Diego Co.; Sacramento Valley; Sierra Nevada foothills from Butte Co. to Tehachapi. Mar.-May. (V. chrysantha Hook.)

4. **V. sheltónii** Torr. Plants 3 to 6 in. high, the stems mostly below ground, arising from a short rootstock; herbage glabrous; leaves orbicular in outline, ¾ to 1¾ in. wide, palmately 3-divided, the cuneate-obovate divisions palmately 3-parted or again cleft into linear or oblong lobes, the lobes obtuse; peduncles scape-like; petals pale yellow, beardless, 4 to 6 lines long; style with a hairy tuft on either side below the stigma.—

636. Viola purpurea Kell.; *a*, habit x ½; *b*, fl. from the back x ½; *c*, pistil x 5; *d*, cross sect. of ovary x 8.

stipules brown-scarious, ovate-subulate; leaves round-cordate, deep green above, often rusty beneath, finely crenate, in age brown-punctate, ½ to 1¼ in. broad; petioles 1 to 7 in. long; petals uniform light yellow, a little purple-veined, 4 lines long; spurs very short and broad.—Woods near the coast, 100 to 500 ft., especially in the Redwood belt, or montane up to 3500 ft.: Monterey Co. to Humboldt Co.; n. to B. C. and Ida. (V. sempervirens Greene.)

7. **V. purpúrea** Kell. MOUNTAIN VIOLET. Fig. 636. Plants 2 to 6 in. high, the stems very short and densely tufted, from a stout vertical root, the young herbage hirsutulose-canescent; leaves rhombic-ovate or oblong (1 or 2 frequently nearly round), dentate or crenate or sometimes nearly entire, ¾ to 1¼ in. long, on petioles 1 to 3 in. long; peduncles surpassing the leaves, 2 to 4 in. long; petals yellow, brownish-purple on the outside, the lower brown-veined at base.—Peaks and mountain ridges, 2500 to 8500 ft.: San Bernardino Mts.; San Gabriel Mts.; Coast Ranges from the San Carlos Range to Siskiyou Co.; Sierra Nevada from Tulare Co. to Modoc Co. Mar.-July. Var. PINETÒRUM Greene. Herbage more or less tomentose; leaves mostly lanceolate or oblong-lanceolate, deeply serrate to entire; flowers small, blue or purple on long filiform peduncles.—Montane, 5200 to 8500 ft.: s. Sierra Nevada from Mariposa Co. to Tehachapi Range; Mt. Pinos; mts. of S. Cal. Var. VENÒSA (Wats.) Brainerd. Leaves often purple-veined, the lower ones round-ovate, 5 to 6 lines long.—Plumas Co. to Shasta Co.

8. **V. nuttállii** Pursh. Plants 2 to 5 (or 7) in. high, the stems leafy and peduncles shorter than or scarcely exceeding the leaves; herbage puberulent, sometimes canescent; leaves oblong-lanceolate to lanceolate or ovate, entire or slightly denticulate or crenulate, 1 to 2¼ in. long, rather shortly attenuate at base into the long petiole; petals yellow, the lowest brown-veined, 2 to 4 lines long.—Meadows or dry pine woods, 2000 to 7000 ft.: Mendocino Co. to Siskiyou Co., thence e. to Modoc Co., thence s. to Tuolumne Co.; n. to Wash., e. to Rocky Mts. Var. LINGULAEFÒLIA Jepson n. comb. Blades oblong-ovate to elliptic or ovate, ciliate, otherwise glabrous or subglabrous, or often hirsutulose on the nerves.—Montane valleys, Nevada Co. to Siskiyou Co.; n. to Ore. (V. lingulaefolia Nutt.)

9. **V. praemórsa** Dougl. Plants 2½ to 10 in. high, at first flowering from the ground, later producing ascending or erect leafy stems which arise from erect or ascending rootstocks; herbage villous-pubescent to nearly glabrous; leaves oblong-ovate to ovate-lanceolate, obtuse, entire or slightly repand-crenulate or barely denticulate, 1 to 3 in. long, more or less attenuate into the long margined petiole; peduncles usually shorter than the leaves; petals canary-yellow, more or less tinged with brown or purple, 5 to 6 lines long; stigma not beaked, bearded below its margin; capsule ovate, pubescent.—Swales in pine woods, 1700 to 7000 ft., Siskiyou and Modoc Cos., thence s. to Mariposa Co.; n. to B. C., e. to Rocky Mts.

10. **V. glabélla** Nutt. Stems erect, mostly weak, naked below or nearly so, 3 to 12 in. high; rootstock horizontal, thick, fleshy-scaly, often branching; herbage glabrous or puberulent, bright green; basal leaves reniform-cordate, 1½ to 3¾ in. broad, on elongated (2 to 11 in.) petioles, the cauline similar or cordate, on petioles 4 to 5 lines long; stipules small and thin-membranous; peduncles about 1½ in. long; petals bright yellow, the lateral and lower purple-veined, 3 to 6 lines long, the lateral ones bearded; spur short and saccate; capsule oblong, 4 lines long, abruptly beaked. — Wet places in woods: Sierra Nevada, 3500 to 7700 ft., from Tulare Co. to Shasta Co.; Coast Ranges near the coast, 25 to 5000 ft., from Monterey Co. to Marin Co. and n.; n. to Alas., e. to northern Rocky Mts. Mar.-May.

11. **V. pedunculàta** T. & G. YELLOW PANSY. Fig. 637. Plants 4 to 13 in. high; stems from a thick and short deeply seated rootstock, branching at the surface of the ground; leaves round-ovate, usually with a truncate base, coarsely crenate, ½ to 1½ in. long, on petioles 1 to 2 in. long; stipules foliaceous, narrowly lanceolate, uppermost often sparingly incised; peduncles erect, 4 to 5 in. long, much surpassing the leaves, bearing flowers

637. Viola pedunculata T. & G.; *a*, habit x ¼; *b*, fl. x 1; *c*, anther column x 3; *d*, capsule x 1; *e*, dehiscing capsule x 1.

¾ to 1⅛ in. broad; petals golden-yellow, the upper ones dark brown on the outside, the others purple-veined within; lateral petals with a bearded spot; stigma bearded.—Low hills, 100 to 2000 ft.: Solano and Napa Cos. to Monterey Co.; s. to coastal S. Cal.

12. **V. ocellàta** T. & G. WESTERN HEART'S EASE. Fig. 638. Stems erect, 5 to 12 in. high, from deep-seated rootstocks; leaves cordate- to triangular-ovate, crenate, acute or abruptly acuminate or somewhat pointed at apex, 1 to 2½ in. long, the basal long-, the cauline short-petioled; stipules small and scarious; peduncles mostly shorter than the leaves; petals 5 to 7 lines long; two upper petals white, violet-purple on the outside, the other petals white or yellow, the lateral with a deep purple spot at base, the lower one purple-veined at base.—Shady woods, chiefly in the Redwood belt, Monterey Co. to Humboldt Co.; n. to Ore. Mar.-June.

638. Viola ocellata T. & G.; *a*, habit x ⅓; *b*, fl. x 1.

13. **V. cuneàta** Wats. Stems leafy, ascending from a short thickish rootstock, 2 to 7 in. long; herbage glabrous; basal leaves deltoid- or round-ovate, abruptly acute, truncatish or subcuneate at base, serrulate or crenulate, ½ to 1 in. long, the petioles slender; the cauline leaves rhombic- to oblong-ovate; peduncles little exceeding the leaves; petals 4 to 6 lines long, the two upper deep purple (especially on the back), the 3 lower ones paler or whitish, the lateral with a purple

blotch at base, the lower purple-veined at base, bordered or blotched with white; spur short, yellowish. — Montane, 2000 to 4000 ft.: n. Humboldt Co.; Trinity, Siskiyou and Del Norte Cos.; n. to southwestern Ore.

14. **V. adúnca** Sm. WESTERN DOG VIOLET. Fig. 639. Stems tufted, very short (3 to 6 lines long) or becoming 1 to 4 in. long, leafy; leaves round-ovate to elliptic-ovate, the lower inclining to be subcordate, obscurely crenate, ⅛ to 1 in. long; peduncles surpassing the leaves; petals violet, turning to red-purple, 4 to 6 lines long, the lateral strongly bearded on the upper side at base, the upper pair with a slight tuft in the middle at base; spur varying from much shorter to quite as long.—Meadows, 3500 to 9500 ft.: San Bernardino Mts.; Sierra Nevada and n. to Siskiyou Co.; hilltops near the sea, 50 to 2000 ft., San Francisco to Humboldt Co.; n. to Alas., e. to Rocky Mts. (V. canina var. adunca Gray.) Var. OXYCÈRAS Wats. Peduncles mostly shorter than the leaves; spur narrow, acute, about as long as the petals.—Sierra Nevada from Mariposa Co. to Nevada Co.

639. Viola adunca Sm.; *a*, habit x ½; *b*, cross sect. of capsule x 2½.

15. **V. howéllii** Gray. Similar to no. 14; leafy stems 5 to 8 in. high; leaves cordate-ovate, 1¼ to 1¾ in. long; peduncles long and scape-like; petals blue, 6 to 8 lines long.—North coastal swamps, rare: Pt. Reyes, Marin Co., and Noyo, Mendocino Co. (acc. E. Brainerd); n. to Wash.

16. **V. langsdórffii** Fisch. Plants 3 to 8 in. high, the leaves and scape-like peduncles from creeping rootstocks or from short ascending stolons; leaves round-cordate, crenulate, 1 to 1¼ in. long, petioles 1½ to 8 in. long; stipules rather large; petals blue or violet (or white), 7 to 10 lines long; lateral petals usually bearded; spur saccate, as broad as long.—Along the coast, Mendocino Co. to Del Norte Co.; n. to Alas.

640. Viola blanda Willd.; *a*, habit x ½; *b*, *c*, side and rear views of flower x 1.

17. **V. nephrophýlla** Greene. Plants 3 to 8 in. high, the leaves and scape-like peduncles arising direct from a short thick rootstock; herbage glabrous; leaves ovate-reniform or -cordate, crenate, ¾ to 2¼ in. long, long-petioled; peduncles usually exceeding the leaves; petals blue or violet, 5 to 7 lines long, the upper slightly and the lower and lateral strongly bearded, the spur saccate.—Montane, springy spots, 3000 to 6000 ft.: San Jacinto Mts.; San Bernardino Mts.; San Gabriel Mts.; Sierra Nevada from Nevada Co. n. to Modoc Co.; n. to B. C., e. to Ariz. Apr.-June. (V. cucullata Bot. Cal. V. palmata var. cucullata Auth.)

18. **V. palústris** L. Peduncles scape-like, these and the leaves arising directly from the slender or filiform rootstock, 3 to 4 in. high; leaves round-

cordate, 1 to 2 in. long; petals pale violet, sometimes white, 3 to 4 lines long. —Del Norte Co.; n. to B. C., thence e. to N. Eng.

19. **V. blánda** Willd. Fig. 640. Plants ¾ to 3 in. high; peduncles scape-like, these and the leaves arising from underground filiform rootstocks; herbage glabrous or nearly so; leaves ovate-cordate to round-reniform, crenulate, thin, ¼ to 1½ in. long, on slender marginless petioles; flowers faintly sweet-scented; sepals oblong- to broadly-lanceolate; petals white, 3 to 4 lines long, commonly beardless, the lowermost usually conspicuously dark-veined.—Montane, 6000 to 8800 ft.: San Jacinto Mts.; San Bernardino Mts.; Sierra Nevada; n. to B. C., e. to the Atlantic. Var. MACLÓSKEYI Jepson n. comb. Petals translucent.—Fresno Co. to Nevada Co.; n. to Ore. (V. macloskeyi Lloyd.)

20. **V. occidentàlis** Howell. Peduncles scape-like, these and the leaves arising directly from the rootstock, 3 to 6 in. high; herbage glabrous; leaves ovate to rhomboid-ovate, ¾ to 2 in. long, attenuate at base into a long petiole; petals white, the lower veined with purple, the lateral ones with a bearded spot.—Marshes, Del Norte Co. (M. S. Baker); n. to southwestern Ore.

LOASÀCEAE. Loasa Family

Herbs or bushes with either rough or stinging hairs, and often with white deciduous bark. Leaves in ours alternate. Flowers regular, complete, white, yellow or reddish. Calyx limb 5-lobed. Petals 5. Stamens usually very numerous, sometimes few and definite, inserted with the petals on the base of the calyx-tube. Ovary inferior, 1-celled; style 1, entire or cleft. Fruit a capsule, crowned with the calyx-lobes (except in Petalonyx).

Stamens many; seeds few to many.
  Stamens inserted below petals; style entire or 3-cleft; seeds on 3 parietal placentae... 1. MENTZELIA.
  Stamens adnate to the united bases of the petals; style 5-cleft; seeds on 5 parietal placentae.....2. EUCNIDE.
Stamens 5; style entire; seed solitary.....3. PETALONYX.

1. MENTZÈLIA L.

Erect annuals or biennials. Leaves in age brittle, adhering very tightly to clothing by means of barbed hairs. Flowers terminal, solitary or cymose, small or showy. Capsule dehiscent at the summit, few to many-seeded. Seeds prismatic, irregularly angled or flat; endosperm scanty. (C. Mentzel, a German botanist of the 17th century.)

A. Petals ¾ to 2½ in. long (½ to 1 in. long in one var. of no. 4).

Outer filaments dilated above and prolonged on either side of the anther as a shoulder or tooth.
  Flowers subtended and the ovary concealed by a pair of white scarious bracts with green laciniate margin; prolongation of filament equaling or exceeding the anther.....1. *M. involucrata.*
  Flowers subtended by small foliaceous bracts not concealing the ovary; prolongation of filament not equaling the anther.....2. *M. tricuspis.*
Outer filaments not prolonged on either side of anther.
  Petals broadly oblanceolate, light yellow, 1¾ to 2½ in. long; 5 of the stamens with petaloid filaments.....3. *M. laevicaulis.*
  Petals obovate, abruptly acuminate, golden-yellow, 1 to 1¼ in. long; 15 of the stamens with dilated bases.....4. *M. lindleyi.*

B. Petals commonly 2 to 3 lines long, never exceeding 9 lines.

Flowers subtended and partly hidden by floral leaves or bracts.
  Filaments all filiform; floral leaves white-membranous; petals 3 to 6 lines long.....5. *M. congesta.*
  Five of the filaments petaloid; floral leaves green-herbaceous; petals 1½ to 2 lines long.....6. *M. micrantha.*
Flowers not hidden by floral leaves or bracts.
  Seeds margined all around with broad white wing.....7. *M. multiflora.*
  Seeds not wing-margined.
    Stamens about 10 to 25; seeds prismatic or 3-sided, mostly truncate at the ends, grooved on the angles, microscopically muricate or tuberculate, seemingly smooth.
      Petals 1 to 2½ lines long; leaves commonly entire (rarely toothed).....8. *M. dispersa.*
      Petals 2½ to 3½ lines long; leaves usually deeply pinnatifid.....9. *M. affinis.*

Stamens 25 or more (or 9 to 13); seeds irregularly angled, not grooved on the angles or rarely on one angle, minutely but obviously tuberculate or muriculate.
Flowers in terminal cymes; capsules erect.
Petals 1 to 2 lines long; stems very white; deserts...10. *M. albicaulis.*
Petals 3 to 6 lines long; stems mostly green or greenish; mostly coastal. 11. *M. gracilenta.*
Flowers solitary in the upper forks of the stem; capsules pendulous or deflexed on the pedicels which are recurved at apex.....12. *M. reflexa.*

1. **M. involucràta** Wats. Stems branching, with very white bark, 3 to 16 in. high; herbage hispid with stiff hairs; leaves linear to oblong-lanceolate or -oblanceolate, coarsely sinuate-dentate, 2 to 6½ in. long, the lower attenuate into a petiole, the upper sessile and clasping; flowers solitary, terminal, closely subtended by a pair of broad white scarious bracts with deeply laciniate-toothed green margin; petals obovate, abruptly acuminate, pale cream-color with a tinge of crimson in center, (¾ or) 1 to 2½ in. long; stamens numerous, slender, ½ as long as the petals, the outer dilated above and continued with a long cusp on each side of the anther; style 3-lobed; capsule 9 to 12 lines long, 3 lines broad at apex; seeds flattened, rugose, minutely tuberculate.—Gravelly washes and rocky cañon sides, 250 to 2200 ft.: Colorado Desert and e. Mohave Desert. May.

2. **M. tricúspis** Gray. Stems branching from or near the base, 3 to 7 in. high; herbage hispidulous; leaves narrow-oblong to oblanceolate, saliently toothed or serrate to subentire, 1 to 1¾ in. long, attenuate at base into a short petiole; flowers terminal on short branches; calyx-lobes filiform-subulate, becoming involute and caudiform-rotate after anthesis; petals straw-white, narrow-obovate, obtuse, sharply apiculate, 6 to 10 lines long; stamens in 4 or 5 rows, the 2 outer rows with dilated filaments, the anthers borne on a short filiform prolongation in the acutely notched apex; ovary oblong, hirsute, papillate-tesselated; style 3-cleft; capsule in age reflexed; seeds strongly rugose, the wrinkles between the rugae few and deep.—Stony hills: Mohave and Colorado deserts; e. to Nev.

641. Mentzelia laevicaulis T. & G.; *a*, fl. branchlet x ⅓; *b*, leaf x ⅓; *c*, *d*, stamens x 1; *e*, cross sect. of ovary x 4½.

3. **M. laevicaùlis** (Dougl.) T. & G. Blazing Star. Fig. 641. Stout branching biennial, 2 to 3½ ft. high, with shining white nearly smooth stems; leaves narrowly oblong or lanceolate, sinuately toothed, 3 to 7 in. long; flowers in clusters of 2 or 3 at the ends of the branches, 3 to 4 in. broad, light yellow; calyx-segments lanceolate, 1 to 1¼ in. long; petals broadly oblanceolate, 1¾ to 2½ in. long, the numerous stamens almost as long; 5 stamens with petaloid filaments; capsule oblong, 1¼ in. long; seeds flat, with a broad thin margin or wing.—Gravelly summer beds of winter flood streams, 100 to 5000 ft., almost throughout Cal.; n. to Ore., e. to Wyo.

4. **M. líndleyi** T. & G. Fig. 642. Stem slender, simple or branching, 6 in. to 2 ft. high; leaves ovate to narrowly lanceolate, pectinately pinnatifid with entire or toothed lobes, or coarsely toothed, 2 to 3 in. long; flowers axillary and terminal; calyx-lobes 5 to 9 lines long, broadly lanceolate, acuminate; petals obovate, abruptly acute, golden yellow with vermilion base

1 to 1½ in. long; stamens numerous, about ¾ as long as the petals; filaments very slender, about 15 of the outer ones with somewhat dilated bases; style entire; capsule linear-clavate, 1 to 1¼ in. long; seeds irregularly angular, minutely tuberculate.—Rocky cañon slopes, 500 to 2000 ft.: Mt. Hamilton Range; Sierra Nevada foothills from Tuolumne Co. to Tulare Co. Var. EREMÓPHILA Jepson n. var. Petals rounded at apex or with a very slight acumination, ½ to 1 in. long; stamens about ⅓ as long as petals.—Desert mesas: Big Pine, Inyo Co. (Hall & Chandler 6680, type); Randsburg.

642. Mentzelia lindleyi T. & G.: *a*, basal leaf x ¼; *b*, fl. branchlet x ⅓; *c*, seed x 3.

5. **M. congésta** T. & G. Stems branching from near the base, 4 to 26 in. high; herbage hispidulous; leaves ovate to lanceolate, pinnatifid, coarsely few-toothed, 1 to 2½ in. long, sessile or the lower sharply petioled; flowers clustered at the ends of the branches, subtended by conspicuous bracts; bracts broad, toothed, 3 to 9 lines long, with a large circular white-membranous center; petals golden-yellow, 3 to 6 lines long; filaments all filiform; capsule clavate, 6 to 9 lines long; seeds irregularly angled, minutely tuberculate, ½ to ¾ line long.—Washes, cañons or montane valleys, 3500 to 8500 ft.: e. slope, e. summits or e. side of the Sierra Nevada from Inyo Co. to Lassen Co.; n. to Ore., e. to Nev. Var. DAVIDSONIÀNA Mcbr. Much less branched; leaves mostly entire; flower clusters smaller; bracts and calyx-lobes about half as large.—San Gabriel and San Bernardino mountains; s. Sierra Nevada in Tulare Co.

6. **M. micrántha** T. & G. Fig. 643. Stems branched from the base, 1 to 3 ft. high, sometimes compactly dichotomous and forming low mounds 1 to 2 ft. broad; herbage rough-hispid, at least above; leaves ovate to lanceolate, acute or acuminate, coarsely serrate or sinuate-toothed, 1 to 3¾ in. long, the basal to 9 in. long, the uppermost roundish, entire, 2 to 6 lines long; flowers congested in very compact clusters, very small, shorter than or scarcely exceeding the short broad floral leaves; petals oval or obovate, 1½ to 2 lines long, twice

643. Mentzelia micrantha T. & G.; *a*, fl. branchlet x ⅔; *b*, fl. x 2½; *c*, stamen x 4; *d*, petaloid stamen x 4.

longer than the calyx-lobes; stamens 10 to 12, 5 of the filaments (opposite the sepals) petal-like, usually with emarginate apex; capsule linear, sharply triangular, 3 lines long; seeds prismatic with grooved angles, 1 line long, twice as long as broad.—Coast Range hills, 1000 to 3000 ft., from w. Colusa Co. and Lake Co. to Monterey Co., and s. to the San Gabriel and San Bernardino Mts. and western Riverside Co. May-June.

7. **M. multiflòra** Gray. Stem shining white, freely and often diffusely branched, 8 to 24 in. high; herbage harshly short-hispid; leaves oblong to oblanceolate, entire to sinuate-pinnatifid, 1 to 3 in. long, the upper sessile, the lower with winged petioles; flowers numerous, terminal on the branches in cymose clusters, subtended by a minute lanceolate bract; calyx-teeth lanceolate-subulate, 3½ lines long, closely reflexed in flower; petals narrow-obovate, 4 to 6 lines long; stamens numerous; about 10 filaments of outer stamens dilated or petaloid, the 5 alternate the petals with anthers, the others without anthers; capsule broadly oblong-obconic, 6 to 11 lines long, commonly naked at summit in maturity, that is without calyx-lobes; seeds white, flat, broadly wing-margined. —Desert washes, 300 to 5000 ft.: Colorado Desert and e. Mohave Desert ; Inyo Co.; e. to N. Mex. and Col., s. to L. Cal. Apr.-May. (M. pumila var. multiflora Urb. & Gilg.)

8. **M. dispérsa** Wats. Fig. 644. Stems usually branching, 8 to 18 in. high; herbage minutely pubescent; leaves oblong to ovate, lanceolate or linear, entire or sometimes toothed, ½ to 4 in. long; flowers approximate near the ends of the branches; petals yellow with a small orange spot at base, elliptic or obovate, 1 to 2 lines long; stamens 12 to 14; filaments not dilated; capsule linear, 6 to 9 lines long; seeds cubical.—Montane, 2500 to 7000 ft.: San Bernardino Mts.; San Gabriel Mts.; Mt. Pinos; Sierra Nevada; North Coast Ranges. Var. PINETÒRUM Jepson n. comb. Stems slender, with few long branches, the branches nearly naked, that is with few much-scattered leaves.—San Gabriel Mts.; Mt. Sanhedrin. (M. pinetorum Hel.) Var. OBTÙSA Jepson n. var. Upper leaves usually many, disposed to be orbicular or round-ovate, often very obtuse, 3 to 5 lines long.—Montane, 4000 to 7000 ft.: San Bernardino Mts. (H. P. Chandler, type); San Gabriel Mts. (San Antonio and Icehouse cañons).

644. Mentzelia dispersa Wats.; *a*, habit x ½; *b*, fl. x 1½.

9. **M. affìnis** Greene. Stem stoutish, branched from the base or simple below, 1 to 3 ft. high; herbage harsh-puberulent; leaves lanceolate or ovate in outline, deeply and often sharply pinnatifid, 1 to 2 (or 3½) in. long; flowers numerous but not congested; calyx-lobes subulate, 2 lines long; petals yellow, often fading whitish, 2½ to 3 lines long; capsule linear, subterete, 9 to 11 lines long, hispid with short stiff white hairs; seeds very short-prismatic, somewhat irregularly or obliquely truncate at each end, with grooved angles. —Stony hillslopes or sandy valley levels, 100 to 2000 (or 4000) ft.: coastal S. Cal.; Colorado and Mohave deserts; n. to the San Joaquin Valley; inner South Coast Ranges.

10. **M. albicaùlis** Dougl. Stem slender, branched from the base, 3 to 12 (or 15) in. high; herbage rough-hispidulose, or the stems glabrous, commonly very

white; leaves linear-lanceolate in outline, sessile, 1 to 4½ in. long, pinnatifid with numerous narrow subequal lobes, the upper broader and often lobed or toothed at base only, or rarely entire; flowers in terminal cymes; calyx-lobes a little shorter than the petals; petals yellow, spatulate or obovate, 1½ to 3 lines long; filaments all filiform; style shortly 3-cleft; capsule linear-clavate, 6 to 9 lines long; seeds irregularly angled with obtuse margins, microscopically but markedly muriculate, ⅛ line long.—Stony mesas and cañon sides, 300 to 5700 ft.: Colorado and Mohave deserts; n. on east side Sierra Nevada to eastern Wash., e. to N. Mex.

11. **M. graciléntа** T. & G. Stem mostly green or greenish, sparingly branched or often simple, ⅓ to 1½ ft. high; leaves narrowly oblong in outline, pinnatifid into broadly linear lobes or only coarsely sinuate-toothed; upper leaves sometimes disposed to be ovate or lanceolate, somewhat sharply cleft or entire; flowers clustered at the summit; petals lemon-yellow with orange base, obovate or oblanceolate, rounded or retuse at apex, 4 to 7 lines long; filaments dilated and somewhat united at base; capsule clavate to obconic, 6 to 9 lines long; seeds in 3 rows, prismatic, minutely tuberculate, ⅔ line long.—Valleys and hillslopes, 200 to 4000 ft.: Monterey Co. to Ventura Co. and the San Jacinto Mts., thence e. to Inyo Co. and Nev., s. to L. Cal. Var. PECTINÀTA Jepson n. comb. Leaves mostly pectinately pinnatifid; petals golden yellow, broadly obovate.—Sierra Nevada foothills from Tuolumne Co. to Kern Co.; Marysville Buttes. (M. pectinata Kell.) Var. VEATCHIÀNA Jepson n. comb. Petals 2½ to 3 lines long.—San Gabriel and San Bernardino Mts.; Mohave Desert; e. to Nev. (M. veatchiana Kell.)

12. **M. refléxa** Cov. Stems stout, diffusely branching from the base, 5 to 8 in. high; herbage hirsute; leaves ovate, coarsely dentate, ¾ to 1¼ in. long, shortly petioled or sessile; flowers solitary in the upper forks; calyx-lobes subulate from a triangular base, 2 to 2½ lines long; petals oblong-oblanceolate, equaling the calyx-lobes; stamens 9 to 13; filaments somewhat dilated; style cleft for ⅓ its length; capsule oblong, 3½ to 4½ lines long, its pedicel reflexed at apex; seeds angular, somewhat compressed, grooved on either face, muriculate.—Desert ranges about Death Valley.

645. Eucnide urens Parry; *a*, fl. branchlet x ½; *b*, long. sect. of fl. x ¾; *c*, cross sect. of ovary x 2.

2. **EUCNÌDE** Zucc.

Herbs or bushes armed with stinging hairs and barbed pubescence. Leaves alternate, ovate, petioled, coarsely toothed. Flowers yellow, pediceled, mostly in terminal bracted cymes. Calyx-limb 5-lobed, persistent. Petals 5, united at base and inserted on the throat of the calyx. Stamens numerous, the filaments filiform, inserted on the base of the petals in a broad band and deciduous with them in a ring. Placentae 5, prominently expanded, covered with ovules; style 5-cleft, the lobes often twisted. Capsule obovate, opening by 5 valves at the summit. Seeds minute, longitudinally striate. (Greek eu, true, and cnide, sea-nettle.)

1. **E. ùrens** Parry. Fig. 645. Low bush 1 to 2 ft. high, the stout stems erect-spreading, or often all decumbent and 2 to 5 ft. long; herbage finely puberulent and covered with 2 kinds of bristles, simple bristles and barbed bristles; bristles on upper surface of leaves with broad

disks at base; leaves broadly ovate, 1 to 2½ in. long; pedicels 3 to 6 lines long; calyx-lobes lanceolate, 6 to 10 lines long; corolla lobes narrowly obovate, abruptly acuminate, 1½ in. long, united at the base into a tube 3 lines long; filaments equaling the calyx-lobes; style stout, cleft to the middle, the cleft portion twisted; capsule ½ in. long.—Shade of cliffs or in rocky places, desert ranges, 2000 to 3000 ft.: Inyo Co.; e. to Utah, thence s. to L. Cal. May.

3. **PETALÒNYX** Gray.

Rough-pubescent perennial herbs or low shrubs, with alternate leaves and small whitish or yellowish flowers. Calyx-limb with 5 linear deciduous lobes as long as ovary. Petals 5, the long claws of the blades connivent, thus simulating a 5-lobed sympetalous corolla. Stamens 5, free, long-exserted. Ovary linear, densely short-hairy, 5-ribbed, 1-celled with one pendulous ovule; style 1, long, exserted; stigma 1. Capsule small, oblong, dehiscing irregularly. (Greek, petalon, leaf, petal, and onyx, claw.)

Leaves sessile, dull or greenish-white.....1. *P. thurberi.*
Leaves petioled, shining.....2. *P. nitidus.*

1. **P. thúrberi** Gray. Sandpaper Plant. Fig. 646. Thickly branched bush, woody at base, 1 to 3 ft. high and 2 to 7 ft. broad; leaves sessile, narrow-ovate, lanceolate or triangular-lanceolate, mostly entire or some few-toothed toward the base, 3 to 8 lines long; flowers greenish-white, in short spikes or heads, these corymbosely disposed; calyx-lobes short, woolly, 1 line long; petals 2 lines long, the blades obovate, obtuse, the claws hairy; stamens 1½ times as long as the corolla; ovary subtended by 2 short bractlets; capsule 1 line long.—Desert plains and mesas, frequent: Colorado and Mohave deserts; Inyo Co.; e. to Ariz. and southern Nev. July.

646. Petalonyx thurberi Gray; *a*, fl. branchlet x 1; *b*, fl. x 6.

2. **P. nítidus** Wats. Stems many from the root-crown, erect or bush-like, 13 to 16 in. high; leaves broadly or round-ovate, coarsely few-dentate on each side, 7 to 12 lines long; inflorescence densely paniculate.—Desert slopes, 4000 to 7000 ft., rare: Colorado and Mohave deserts; Inyo Co.; e. to Utah.

DATISCÀCEAE. Datisca Family

Perennial herbs with alternate and in ours divided leaves. Flowers dioecious or in ours the pistillate commonly with a few stamens. Calyx synsepalous. Corolla none. Stamens indefinite. Ovary inferior, 1-celled, with 3 parietal placentae; styles 3, bifid. Fruit a capsule, opening at the top between the styles.

1. **DATÍSCA** L.

Stout glabrous herb. Leaves divided and more or less incised and sharply serrate. Flowers in clusters in the axils of the leafy branches. Calyx of staminate flower very short, with 4 to 9 unequal lobes; stamens in ours 8 to 12, mostly 10; filaments short. Calyx of pistillate flowers with ovoid tube, somewhat 3-angled, 3-toothed; stamens (when present) 2 to 4, alternate with the teeth. Seeds numerous, small, in 2 to several rows on the placentae. (Derivation unknown.)

647. Datisca glomerata Brew. & Wats.; *a*, lower leaf x ¼; *b*, pistillate fl. branchlet x ¼; *c*, pistillate fl. x 2; *d*, staminate fl. x 2.

1. **D. glomeràta** (Presl.) Baill. Durango Root. Fig. 647. Stems commonly clustered, stoutish and somewhat fistulous, erect, branching above, 2½ to 5 (or 8) ft. high; leaves 5 to 6 in. long; staminate calyces less than 1 line long, the pistillate calyces 4 to 5 times as long.—Dry stream beds or washes, 150 to 5000 ft.: Coast Ranges; Sierra Nevada; S. Cal.; s. to Mex. May-June.

CACTÀCEAE. Cactus Family

By Samuel B. Parish

Succulent plants, the stems columnar, globose, terete or flattened, ours leafless or (in Opuntia) with small subulate early caducous leaves. Branches, spines, flowers and other parts developed from specialized organs called areoles. Flowers usually perfect, solitary and sessile. Sepals and petals numerous, commonly intergrading, imbricated in several rows, their bases coalescent, forming a tube or cup adherent to the ovary. Stamens numerous, the filaments inserted on the throat of the perianth. Style 1; stigmas 2 to many; ovary inferior, 1-celled; ovules numerous, parietal. Seeds usually numerous.

Stems jointed, cylindrical or flattened; areoles containing numerous minute barbed bristles (glochids); leaves small, subulate, early deciduous; flowers and barbed spines produced from the same areoles.....1. Opuntia.
Stems continuous, leafless; areoles destitute of glochids; spines never barbed; spiniferous and floriferous areoles distinct.
Stems globose, obovoid, cylindrical or columnar, ribbed; spines borne in bundles on the ribs.
Flowers produced above mature spine-bundles below the summit of the ribs....2. Cereus.
Flowers produced above nascent spine-bundles at the summit of the ribs.....3. Echinocactus.
Stems globose or obovoid; spines borne on tubercles and the small flowers produced between the tubercles.....4. Mamillaria.

1. OPÚNTIA Mill. Prickly Pear

Plants shrub-like, with jointed cylindrical and tuberculate or flattened stems. Areoles situated at the axils of the small leaves, and bearing numerous glochids and usually spines and wool. Flowers with rotate corollas. Sepals thick, green or partly colored, grading into the purple, yellow or reddish petals. Stamens shorter than the petals. Ovary bearing leaves and glochids, spiny or spineless; stigma-lobes short. Fruit succulent or dry, obovate-truncate; seeds large, meniscoidal or discoidal, often margined; cotyledons foliaceous; embryo curved. (Old Latin name.)

A. Joints cylindrical, tuberculate.—Subgenus Cylindropuntia.

Spines polished, covered with loose hyaline sheaths.
Stems slender, the woody axis solid; tubercles flattened.....1. *O. ramosissima.*
Stems thick and fleshy, the woody axis a reticulated cylinder.
Ultimate joints readily disarticulating; fruit proliferous, spineless, or nearly so.
Tubercles nearly quadrangular; spines whitish, shining; deserts.....2. *O. bigelovii.*
Tubercles longer than wide; spines dull, yellow; coastal....3. *O. prolifera.*
Joints firmly attached; tubercles prominent, elongated.
Tubercles 2 to 3 times as long as wide.
Fruit-spines stoutish, in bundles of 8 to 12; deserts.4. *O. acanthocarpa.*
Fruit-spines acicular, solitary or few; interior.....5. *O. parryi*

Tubercles less than twice as long as wide.
Tubercles ovate; principal spines 3 or 4; deserts....6. *O. echinocarpa.*
Tubercles flattish; principal spines 7 to 20; coastal...7. *O. serpentina.*
Spines rugulosly roughened, gray, sheathless; woody skeleton wanting, or rudimentary...
8. *O. clavata.*

B. Joints flattened, not tuberculate.—Subgenus PLATYOPUNTIA.

Fruit dry.
Fruit spineless, or nearly so.
Joints spineless.....9. *O. basilaris.*
Spines few, short and slender.....10. *O. treleasii.*
Fruit spiny.
Areoles approximate.
Spines acicular, or a few bristle-like.....11. *O. erinacea.*
Spines all bristle-like, elongated, copious.....12. *O. ursina.*
Areoles distant; spines subulate; usually unarmed below.....13. *O. rhodantha.*
Fruit fleshy or juicy.
Arboreous, with definite trunk and upwardly-spreading branches; or sometimes large shrubs.
Spines wanting or few, if present whitish or brown; joints large; introduced species.
Fruit yellowish or reddish, fleshy; umbilicus flat.....14. *O. megacantha.*
Fruit purple throughout, soft; umbilicus depressed.....15. *O. ficus-indica.*
Spines present, yellow; fruit purple with green flesh; deserts..16. *O. chlorotica.*
Shrubby, much-branched from the base; spinose.
Joints 6 to 12 in. long; flowers yellow.
Stems erect or ascending; cismontane.....17. *O. occidentalis.*
Stems assurgent or prostrate; deserts.....18. *O. mojavensis.*
Joints 3 to 6 in. long, prostrate or assurgent; flowers yellow or purplish; cismontane.....19. *O. vaseyi.*

1. **O. ramosíssima** Engelm. Erect, few (rarely numerous) -stemmed, 2 to 4 ft. high; mature stems grayish, very woody; usually sparsely spinose above, sometimes spineless, rarely spiny throughout; tubercles tesselate, 4 to 6-angled, the solitary spines from an apical groove, 1 to 1½ in. long, the yellow sheaths loose and shining; flowers ¼ in. long, purplish; fruit dry, 1 in. long, densely covered with slender tawny spines and abundant axillary wool.—Gravelly benches or washes, frequent but solitary or distant: Colorado and e. Mohave deserts; Inyo Co.; s. Nev. to Ariz. and Sonora.

2. **O. bigelòvii** Engelm. Erect, 2 to 4 ft. high, the usually solitary stem upwardly branched, above forming a close head; joints short, turgid, the ultimate readily detached, the primary strongly adherent, the lowest hanging dead and blackened about the trunk; tubercles quadrangular, elevated, concealed by the abundant divergent spines, 1 to 1¼ in. long, yellowish and glistening; flowers in clusters, greenish-yellow, 1½ in. high; fruit dry, spineless or nearly so, 1 in. high, few-seeded, usually sterile.—Hillsides or benches, usually gregarious, often extensively so: Colorado and Mohave deserts; s. Nev. to Ariz. and n. L. Cal.

3. **O. prolífera** Engelm. Stems several, stout, erect, 3 to 6 ft. high, with numerous spreading branches, the tumid ultimate joints 3 to 6 in. long, disarticulating; tubercles short, each with 6 to 12 spines ½ to 1 in. long, their loose sheaths rusty-yellow; flowers red; fruit subglobose, 1 in. long, spineless, or nearly so, usually sterile.—Arid hills near the coast, forming dense thickets: San Pedro to San Diego; n. L. Cal.

4. **O. acanthocárpa** Engelm. & Bigel. Erect, 4 to 6 ft. high, the stout stems few, with numerous alternate and acutely ascending branches; tubercles prominent, elongated and laterally flattened, each bearing 8 to 25 unequal yellow spines, 1 in. long or less, their sheaths whitish or yellow; flowers reddish; fruit dry, armed with bunches of 10 to 12 stoutish spines; seeds more or less angled, the margins channeled.—E. Mohave Desert (New York Mts.; Providence Mts.); Nev. to s. Utah, Ariz. and Sonora; usually gregarious, but rare in Cal.

5. **O. párryi** Engelm. Stems few, erect, 2 to 4 ft. high, branches upwardly spreading; joints 6 to 12 in. long; tubercles prominent, ¾ in. long; areoles oblong, ⅛ in. long, bearing abundant white wool and 1 to 3 unequal acicular yellow spines (these brown in age, ½ to 1 in. long, deflexed or porrect) and 4 to 7 shorter ones; flowers numerous, ¾ in. long, clustered about the ends of older stems, yellowish, tinged with red; fruit broadly obovate, ¾ to 1 in. long, with 3 or 4 rows of prominent tubercles, the upper ones each

bearing a single acicular spine, ¼ to ½ in. long; seeds 1 to several, their margins channeled.—Gravelly soil, interior arid valleys of cismontane S. Cal.: Riverside; San Bernardino; Banning; abundant but scattered and not forming close thickets. The fruit remains green and attached to the joint at least a year, at last becoming dry and falling off.

6. **O. echinocárpa** Engelm. & Bigel. Erect, assurgent or declined, either 1 to few-stemmed and loosely few-branched, or with few ascending stems and numerous spreading branches forming a compact bush, 3 to 5 ft. high (var. robustior), joints 3 to 6 in. long; tubercles short, ovate, each armed with 3 to 4 stout yellowish spines, ½ to 1 in. long, and 8 to 10 shorter ones; flowers clustered, yellowish, tinged with red; fruit dry, the upper areoles bearing bundles of 8 to 12 spines ¼ to ¾ in. long, usually unarmed below the middle; seeds numerous, their margins strongly channeled.—Mohave and Colorado deserts; e. to Utah and Ariz., s. to L. Cal.; individuals common but solitary, not forming thickets.

7. **O. serpentìna** Engelm. Prostrate or assurgent, with divaricately ascending branches; branches elongated-cylindrical, not tumid, 6 to 12 in. long; tubercles prominent, short and flattish, each bearing 7 to 20 yellowish spines; flowers greenish-yellow, tinged with red; fruit broadly ovoid, deeply umbilicate, very spiny.—Dry coastal hills, San Diego; s. to northern L. Cal.

8. **O. clavàta** Engelm. Stems prostrate, rooting along the lower surface; branches approximate, simple or 1 to 2-branched, clavate, erect, 3 to 5 in. high; tubercles prominent, ¼ to ½ in. high; areoles circular, filled with white wool and few glochids; spines in clusters of 3 or 4, stout, flattened, divergent, ashy gray, becoming brownish at the joint, transversely rugulose, the lowest dagger-like, 1 to 2 in. long, and 6 to 10 unequal and acicular, all destitute of sheaths; flowers yellow; fruit becoming dry, ovate, 2 in. long, the deep umbilicus filled with the whithered floral remains, the large tubercles having cushions of white wool and margined with abundant radiate yellow glochids, ¼ in. long, with or without a few slender spines; seeds nearly ¼ in. wide.—Sandy soil, forming mats, the prostrate stems often buried in the sand: Colorado Desert; e. Mohave Desert; e. to southern Nev., Col. and N. Mex. The spines and glochids appear to the touch, and even under a lens, to be destitute of barbs, but with the microscope a few weak barbs are seen near the points.

9. **O. basilàris** Engelm. Low and spreading, not over 1 ft. high, few-jointed; joints orbicular to obovate, mostly obtuse, 3 to 8 in. long, glaucous, glabrous or somewhat pubescent; areoles approximate, filled with abundant brown glochids, spineless; flowers 2 to 2½ in. long, purple to rose-purple; fruit dry, spineless; seeds about ¼ in. wide, more or less angled, the raphe prominent.—Frequent in small clumps: Colorado and Mohave deserts and bordering mountain ranges, 3000 to 7000 ft; n. to Inyo Co.

10. **O. treléasii** Coulter. Stems spreading at base, branches assurgent, of 2 to 4 obovate joints, somewhat glaucous; areoles elevated, filled with yellow-brown glochids and mostly solitary (1 to 3) acicular divergent spines ¼ in. or less long; flowers "red to scarlet" or "rose-colored"; fruit dry, subglobose, spineless or spiny; seeds nearly ¼ in. wide.—Forming clumps on plains and hills, upper end of the San Joaquin Valley.

11. **O. erinàcea** Engelm. Stems prostrate, the ascending or erect branches forming low clumps; joints ovate to oblong, 2 to 5 in. long; areoles approximate; spines white to brown, 1 to 3 in. long, acicular, or some bristle-like and longer; flowers nearly 2 in. long, "red" or yellow; fruit covered with slender spines.—Gravelly or stony slopes, Mohave Desert; e. to Nev., Utah and Ariz.

12. **O. ursìna** Weber. GRIZZLY BEAR CACTUS. Several-stemmed, the ascending or erect branches forming clumps 8 to 12 in. high; joints obovate or oblong, 4 to 6 in. long; areoles approximate, bearing copious flexile bristle-like ashy-gray spines 3 to 8 in. long, which conceal the joints; flowers yellow, 1 to 2 in. high; ovary-areoles bearing wool and short slender spines; fruit dry and very spiny.—Gravelly slopes, e. Mohave Desert

13. **O. rhodántha** Schuman. Stems prostrate; branches few-jointed, forming clumps; joints obovate to oblong, 1 to 4 in. long; areoles distant; spines 3 or 4, stout, ½ to 1 in. long, brownish, and 2 or 3 shorter, mostly confined to the uppermost areoles; flowers about ½ in. long, pink, or "red to salmon-color"; fruit dry and spiny; seeds small.—White Mts., ne. Inyo Co., 8000 to 11,100 ft.; e. to Neb.

14. **O. megacántha** Salm-Dyck. Usually arboreous, with a distinct trunk, 8 to 12 ft. high, or a stout bush, with ascending branches, 4 to 6 ft. high; joints thick, oblong, 6 to 18 in. long; areoles 1 to 2 in. distant, glochids soon deciduous, spineless, or with few brown spines, mostly near the margins; flowers large, yellow; fruit ovoid, 3 to 5 in. long, the umbilicus broad and flat, flesh crisp, palatable; seeds brownish.—Valleys, coastal S. Cal. Formerly much cultivated at the missions and ranchos, about some of which remains yet persist, it is in places spontaneous, and occasional in ornamental cultivation. Both this species and the next were in cultivation as fruit trees long previous to the discovery of America, and exhibit a diversity of variation comparable with that of the common cultivated fruits.

15. **O. ficus-indica** Mill. INDIAN FIG. Like no. 14 in habit, size and articulation, but usually more spinose; spines 1 to 3, whitish, somewhat flattened, unequal, the longest 1 to 1½ in. long; flowers yellow "or red"; fruit ovoid, 2 to 3 in. long, purple throughout, with a juicy flesh, edible; umbilicus deeply depressed.—Coastal S. Cal. (Santa Barbara; San Gabriel).

16. **O. chlorótica** Engelm. & Bigel. Arborescent in habit, 3 to 8 ft. high, with short and stout spiny trunk and ascending branches; joints 4 to 8 in. long, orbicular to ovoid or obovoid, light green; areoles approximate, prominent, each bearing 3 to 6 unequal slender yellow spines, mostly reflexed, about 1 in. long; flowers yellow; fruit 1½ to 2 in. long, purple without, the flesh green, edible; seeds small.—Stony slopes or in cañons, bases of the mountains; solitary or distant: Mohave and Colorado deserts; Nev. to Ariz., Sonora and n. L. Cal.

17. **O. occidentàlis** Engelm. & Bigel. Several-stemmed from the base, the stout assurgent branches 3 to 5 ft. long; joints elongated-obovate, 6 to 12 in. long; areoles remote, prominent, each bearing 1 to 4 stout brown spines ½ to 1 in. long; flowers yellow, 2 to 3 in. long; fruit obovoid, 2 in. long, spineless; seeds orbicular, prominently margined, ¼ in. wide.—Common on sandy or gravelly mesas or dry washes, 1500 to 7000 ft., often forming thickets, Santa Barbara to the San Bernardino Mts. Var. COVÍLLEI Parish n. comb. More erect, with thinner joints and slenderer spines.—Interior valleys of coastal S. Cal.: Claremont; San Bernardino; Elsinore. (O. covillei Britt. & Rose.) Var. LITTORÀLIS Parish n. comb. Joints thick, orbicular to oblong; spines becoming flattened, yellow.—Near the coast, Santa Barbara to San Diego. (O. engelmannii var. littoralis Engelm.) These opuntias (no. 17), here regarded as forming a single variable species, are alike in flower and fruit, but differ considerably, but indefinitely in the size, shape and thickness of the joints, characters apparently having some relation to geographical distribution, but affording no satisfactory lines of specific, and hardly of varietal, distinction.

18. **O. mojavénsis** Engelm. Stems declined, the stout branches assurgent; joints widely obovate, 9 to 12 in. in diameter; spines in clusters of 2 to 6, somewhat flattened, white, and at base reddish-brown, unequal, the longest 2 in. long; spicules prominent, as long as ½ in.; flowers yellow; fruit ovate, about 1 in. long, spineless.—Mts., e. Mohave Desert.

19. **O. vàseyi** Britt. & Rose. Stems declined or prostrate, the spreading branches forming close often extensive mats 6 to 12 in. high; joints ovate, obovate or orbicular, 3 to 6 in. long; areoles large, each bearing 1 to 3 short brownish spines, or spineless; flowers clear to salmon-yellow; fruit spineless, ovate to globose, purple, juicy; seeds numerous, brown.—Abundant on gravelly mesas or in dry washes, inner valleys of cismontane S. Cal. Var. MAGÉNTA Parish n. comb. Usually somewhat smaller and with smaller joints; flowers magenta.—With the species and completely intergrading with it. (O. magenta Griff.)

2. **CÈREUS** Mill. Torch Cactus

Plants varying greatly in form and habit, ours columnar, oblong or cylindric, with spine-bearing ribs. Floriferous areoles immediately above mature spiniferous areoles, flowers therefore lateral. Flowers funnelform, ours with short tube and spreading limb. Ovary bearing scales, which are with or without wool or spines in the axils. Seeds small, black, numerous. (Latin cereus, waxen, referring to the candle-like stem of some species.)

Flowers yellow or white.
- Stems cylindric; flowers small, yellow; scales of the tube and ovary spiny in the axils; fruit spiny.—Subgenus Bergerocactus.....1. *C. emoryi.*
- Stems stout, columnar, erect; flowers large, white; scales of the tube and ovary sparsely woolly in the axils; fruit spineless or nearly so.—Subgenus Carnegiea.....2. *C. gigantea.*

Flowers purple or red; stems oblong to globose; scales of the tube and ovary spiny; fruit spiny.—Subgenus Echinocereus.
- Stems few, in a loose cluster; flowers purple.....3. *C. engelmannii.*
- Stems many, in dense masses; flowers scarlet.....4. *C. mojavensis.*

1. **C. èmoryi** Engelm. Branches numerous, 6 to 18 in. long, densely spinose; ribs 20 to 25; areoles approximate; spines 10 to 30, yellow, in age brown, unequal, the central 1 to 1¼ in. long, stout and exceeding the slender radials; flowers about ½ in. long; ovary and fruit globose.—Near the coast, Orange and San Diego Cos., San Clemente Isl.; n. L. Cal.

2. **C. gigantèa** Engelm. Giant Cactus. Suwarro. Stems simple, or with one or few candelabriform branches, up to 36 ft. high; ribs about 20; spines in clusters of 10 to 25, the central up to 2 in. long, exceeding the radials; flowers borne near the summit of the stem; tube stout, green; limb widely spreading, at length reflexed; ovary oblong; stigma lobes 12 to 18; fruit oblong, red or purple, edible.—Rocky hillsides, in groups along Colorado River: Riverside Mts.; opposite mouth of Bill Williams River; above Yuma dam; e. to Ariz.

3. **C. engelmánnii** Parry. Stems 5 to 20, stout, oblong, erect, 6 to 12 in. high; ribs 11 to 13; spines in clusters of 10 to 12, straight, or somewhat curved, white or yellowish, becoming brown, divergent, the central 3 or 4 stout, subulate, 1 to 1½ in. long, and 8 to 15 unequal, short and acicular; flowers showy, purple, 2 to 3 in. long; fruit orbicular to obovate, clothed with clusters of acicular spines ½ to ¾ in. long; seeds puncticulose.—Stony or gravelly hills and dry washes, frequent: Inyo Co., e. Mohave Desert; Colorado Desert; e. to Utah and Ariz., s. to Sonora and L. Cal.

4. **C. mojavénsis** Engelm. Stems 10 to 600, 4 to 8 in. long, compact in dense rounded clumps; ribs 10 to 12, strongly tuberculate; spines 3 to 8, whitish or gray, straight or curved, the 1 to 3 central slender and porrect, 1 to 1½ in. long, the others similar but shorter, radiate and interlocking; flowers scarlet, 2 to 2½ in. high; ovary and fruit bearing slender spines.—Crevices of cliffs or rocky slopes in the mts.: Inyo Co.; Mohave Desert; e. to southern Nev. and to Ariz.

3. **ECHINOCÁCTUS** Mill. Hedgehog Cactus

Stems cylindric, oblong or ovoid, ours all with spine-bearing ribs. Flowers short-tubular, borne on areoles above or near the young spiniferous areoles, therefore circular at the summit. Ovary scaly. Fruit globose to oval, dry or fleshy. (Greek echinos, a hedgehog, and cactus, the stems beset with spines.) Some of our species afford a relief to thirsty desert travelers, who by slicing off the top of a stem and pounding the succulent tissue form a basin containing a considerable quantity of potable juice.

Principal spines annulate.
- Scales of the ovary acicular, their axils copiously woolly.....1. *E. polycephalus.*
- Scales of the ovary scaly.
  - Stems columnar, rarely obovoid; deserts.....2. *E. cylindraceus.*
  - Stems depressed-globose; coastal.....3. *E. viridescens.*

Spines never annulate.
- Principal spines flattened, 1-ridged above.....4. *E. polyancistrus.*
- Spines all subulate, bulbous at base.....5. *E. johnsonii*

1. **E. polycéphalus** Engelm. & Bigel. NIGGER-HEADS. Stems globose, 8 to 10 in. in diameter, forming compact rounded clumps of 10 to 60 heads; ribs 10 to 20, tuberculately interrupted; central spine 1, stout, 1 to 3 in. long, curving but not hooked, and 3 to 4 slender ones; radials 8 to 10, shorter and unequal, all ashy-gray and flattened; flowers yellow, 1½ to 2 in. long, little surpassing the acicular scales of the ovary, and enveloped in the abundant wool of their axils; fruit dry, densely woolly; seeds angulate, minutely tuberculate.—Rocky places in the deserts: Mohave Desert; Inyo Co.; e. to Utah and Ariz.

2. **E. cylindràceus** Engelm. BARREL CACTUS. Stems simple, erect, stout, columnar, up to 8 ft. high, rarely elongated-obovoid and 2 to 3 ft. high; ribs 20 or more, interruptedly tuberculate; central spines 1 to 4, stout, compressed, erect or decurved, 2 to 6 in. long, one or more of them hooked; radials 5 to 7 stout and 3 to 7 slender, none of them hooked; flowers yellow, 1 to 2 in. long, the outer segments narrowly oblong, the inner linear; fruit elongated-obovoid, 1 to 1¼ in. long, greenish, at length dry; seeds smooth and shining.—Frequent on rocky hills or gravelly benches, Colorado and e. Mohave deserts; Inyo Co.; e. to Utah and Ariz., s. to northern L. Cal. Rarely small globose branches are developed at the base or on the sides of the stems; the spines are usually more or less red, but sometimes yellow or white; they vary greatly in length and degree of curvature, and are frequently very long and much intertangled.

3. **E. viridéscens** Nutt. Simple (rarely 1 to few-branched at base), 10 to 15 in. high, and usually broader than high; ribs 10 to 20, tuberculately interrupted; central spines 4, stout, brown, compressed, cruciately divergent, 1 in. long, or less, the lowest longer and broader than the others; radials 10 to 20, acicular, unequal, less than ½ in. long; flowers yellowish, 1½ in. high, the petals with a reddish midvein; fruit obovate to subglobose, greenish, the broadly subcordate scales distant and few; seeds minutely pitted.—Dry grassy hills about the bay of San Diego; much depressed, and often nearly hidden by the surrounding herbage.

4. **E. polyancístrus** Engelm. & Bigel. Stems simple, columnar to ellipsoidal, 8 to 12 in. high; ribs 12 to 16, tuberculately interrupted; central spine 1, stout, flattened and ribbed, 2 to 3 in. long; radials 5 to 7, brown, hooked, 2 in. long, and 15 to 20 slender, straight and unequal, less than ½ in. long; flowers yellow, about 2 in. high; scales of the ovary few and small, hyaline-margined; fruit dry, pyriform, nearly naked; seeds tuberculate.—Occasional on gravelly mesas, Mohave Desert; e. to southern Nev.

5. **E. johnsónii** Parry. Simple, or few-branched from the base, erect, short-cylindrical, 4 to 9 in. high; ribs 10 to 20, tuberculately interrupted; principal spines 6 to 10, yellow, in age brown, straight or curved, nearly equal, about 1 in. long, radiate; radials 10 to 20, short, bristle-like, all bulbously enlarged at base; flowers "pink," about 1 in. high and as wide; fruit densely covered with bristle-like spines.—Infrequent, Inyo Co.; e. to Utah.

4. MAMILLÀRIA Haw.

Globose to oblong, simple or few-branched. Areoles naked or woolly, in our species all spiniferous, borne at the apex of mamilliform tubercles. Flowers campanulate or funnelform, produced from distinct areoles at the bases of the spiniferous areoles, mostly near the summit of the stems. Fruit clavate to globose, scarlet or greenish. Seeds black, smooth or punctate. (Latin mamilla, a nipple, the stem bearing tubercles.)

Tubercles not grooved; one or more of the central spines hooked.
- Seeds with a spongy appendage; radial spines 30 to 60 ..... 1. *M. tetrancistra.*
- Seeds unappendaged; radial spines 10 to 20.
  - Young areoles densely woolly; coastal ..... 2. *M. dioica.*
  - Areoles naked; deserts ..... 3. *M. grahami.*

Tubercles grooved; spines all straight.
- Central spines 3 or 4; flowers straw-color ..... 4. *M. deserti.*
- Central spines 12 to 14; flowers purplish ..... 5. *M. alversonii.*

1. **M. tetrancístra** Engelm. FISH-HOOK CACTUS. Simple, or rarely few-branched at base, globose to oblong, 4 to 10 in. high; young tubercles woolly

in the axils, at length naked; central spines 1 to 4, dark purple nearly to the base, about 1 in. long, one or all hooked; radials shorter, very numerous, bristle-like, white, radiately interlocked; flowers pinkish, about 1 in. long; fruit ovoid to obovoid, scarlet, ½ in. long; seeds black, tuberculately roughened, partially immersed in an ash-colored conical spongy appendage.—Gravelly plains and hillsides: Colorado Desert; e. Mohave Desert; Inyo Co.; e. to Nev. and Utah.

2. **M. dioìca** K. Bdg. Simple or caespitosely few-branched, globose to obovoid, 2 to 10 in. high; central spines 1 to 4, brown, the lowest stouter, about ¼ in. long; radials 10 to 20 white, about ⅛ in. long, interlocking; flowers less than 1 in. long, yellowish-white, incompletely dioecious; fruit clavate to ovate.—Sandy soil, about San Diego; s. to L. Cal.

3. **M. gràhami** Engelm. Simple or caespitosely few-branched, 2 to 3 in. high; lower central spine purple, hooked, ¾ in. long, usually exceeding the 1 to 2 straight ones, or these wanting; radials 12 to 15, white, nearly equal; flowers about ¾ in. long, white with purple midvein; fruit obovate to clavate, ½ to 1 in. long, scarlet; seeds minutely punctate.—Arid hills, Colorado Desert; e. to Ariz., s. to Sonora.

4. **M. déserti** Engelm. Simple or 4 to 5-branched at the base, globose to oblong, 3 to 8 in. high; central spines 3 to 4, ½ in. long, brown-tipped; radials 15 to 20, slender, radiate and interlocking, concealing the surface; flowers about 1 in. high, the outer segments fimbriate.—Mts., e. Mohave Desert; e. to southern Nev.

5. **M. alversònii** Orcutt. Simple or 1 to few-branched at or above the base, 3 to 8 in. high; spines dark purple above the white base, ½ to ¾ in. long; radials numerous, white, slender, divergent, interlocked, concealing the surface; flowers light purple, the outer segments strongly ciliate; fruit clavate; seeds brown, tuberculate.—Arid mountains dividing the Colorado and Mohave deserts. A larger plant than M. deserti and with stouter spines, but perhaps no more than a form of it; both are insufficiently known.

CUCURBITÀCEAE. Gourd Family

Herbs, mostly tendril-bearing and succulent, with simple palmately lobed leaves. Flowers unisexual. Corolla 5 to 7-lobed, inserted on the calyx. Calyx-lobes narrow or tooth-like. Calyx-tube in the pistillate flower adherent to the 1 to 6-celled ovary; stigmas 2 or 3; placentae parietal or projecting from the axis. Staminate flower with 3 stamens, 2 of these with 2-celled anthers, the third one with a 1-celled anther. Fruit gourd-like, or dry and dehiscent. Seeds large, anatropous, without endosperm.

Flowers large, yellow or yellowish, all solitary; fruit smooth, fleshy, 3 to 5-celled..... 1. Cucurbita.
Flowers small, white or whitish, the staminate in racemes; fruit more or less spiny or echinate, becoming dry.
  Fruit 2 or 4-celled, 2 to many-seeded; leaves scaberulous or puberulent to glabrous; mostly cismontane species..... 2. Echinocystis.
  Fruit 1-celled, 1-seeded; leaves thickly sprinkled with disk-like pustules; desert species..... 3. Brandegea.

1. CUCÚRBITA L.

Ours perennial herbs with large roots. Stems prostrate, vine-like, scabrous. Flowers large, yellow, solitary. Filaments distinct. Fruit a smooth globose gourd, 3 to 5-celled. (Latin name of the gourd.)

Leaves triangular-ovate; fruit 3-celled, its pedicel without thickened ridges..... 1. *C. foetidissima.*
Leaves palmate; fruit 5-celled, its pedicel with thickened ridges at summit..2. *C. palmata.*

1. **C. foetidíssima** H.B.K. Calabazilla. Stems 5 to 15 ft. long; leaves erect, triangular-ovate, cordate or subcordate at base, 4 to 10 in. long; calyx-tube of staminate flower 6 to 8 lines long; corolla 3 to 4 in. long; gourd 3 to 4 in. in diameter.—Sandy flats or plains, San Joaquin Valley to S. Cal. Also called Chili Coyote and used by Spanish-Californians, the root as a cleanser, the leaves medicinally.

2. **C. palmàta** Wats. Coyote Melon. Stems trailing, several ft. long;

leaves palmately 5-cleft, 3 to 4½ in. broad; calyx-tube of staminate flower 10 to 12 lines long; corolla 1¾ to 2¾ in. long; gourd 3 in. in diameter; seeds thicker than in C. foetidissima.—Dry plains and mesas: coastal S. Cal. and n. to the San Joaquin Valley; Colorado Desert and n. to Inyo Co.

2. ECHINOCÝSTIS T. & G. Big Root

Trailing or climbing herbs with branched tendrils and ivy-like but thin leaves. Flowers small, greenish or white, monoecious, the staminate in axillary racemes or panicles, the pistillate pediceled and solitary in the same axils. Calyx-teeth very small or obsolete. Corolla rotate or campanulate with 5 to 7 lobes or lanceolate segments. Staminate flowers with the short filaments united and the anthers distinct or coherent. Pistillate flowers with staminodia or none; ovary globose or oblong, 2 to 4-celled, with 1 to 4 ovules in each cell; style very short; stigmas 2 or 3-parted or -lobed. Fruit prickly, somewhat fleshy or pulpy, at length dry and bursting irregularly on the sides or near the apex. Seeds ovoid or broadly oblong, more or less compressed, surrounded by a marginal line. (Greek echinos, a hedgehog, and kustis, a bladder, in reference to the spiny fruit.) Our species (subgenus Marah) are all perennial from exceedingly large, often deep-seated, fusiform or globose roots, sometimes as large as and not unlike the shape of a man's body, whence the common name, "Old Man in the Ground." The germination of the seed is hypogeous.

Corolla rotate or somewhat saucer-shaped; staminate racemes mostly with many to numerous flowers; spines more or less puberulent.
Corolla dull or greenish white; fruit globose; central Cal. ..... 1. *E. fabacea.*
Corolla clear white; fruit oblong; S. Cal. to Monterey Co. ..... 2. *E. macrocarpa.*
Corollas campanulate; staminate racemes relatively few-flowered.
Herbage green; pistillate flowers with abortive stamens; spines puberulent or sometimes glabrous.
Fruit cylindric; s. Sierra Nevada foothills ..... 3. *E. horrida.*
Fruit ovate or globose-ovate, commonly long-beaked; Coast Ranges ..... 4. *E. oregana.*
Herbage glaucous; pistillate flowers without abortive stamens; prickles glabrous; n. Sierra foothills ..... 5. *E. watsonii.*

1. E. fabàcea Naud. Common Man-Root. Fig. 648. Stems 12 to 30 ft. long; herbage nearly glabrous or rough-scabrous; leaves more or less round-cordate in outline, 2 to 4 in. broad, shallowly or often rather deeply 5 to 7-lobed; staminate flowers many in slender simple or compound racemes 3½ to 5 in. long, the pedicels 1 to 3 lines long; corolla 3 to 4 lines broad, dull or greenish-white; pistillate flowers 5 to 6 lines broad, destitute of abortive stamens, the pedicels 5 to 9 lines long; ovary globose, 2-celled, ovules 1 or 2 in each cell; stigma depressed, circular, almost sessile; fruit globose, 2 in. in diameter, very densely spinose; spines stout or more commonly slender, 3 to 4 (or 5) lines long, sparingly and mostly obscurely puberulent; seeds commonly 4, sometimes less, oblong-ovoid, 9 to 13 lines long, 6 lines broad, surrounded by a shallow groove or darker line.—Hillslopes or high sandy places in valleys: Coast Ranges from Sonoma Co. to Monterey Co.; Great Valley; cent. Sierra Nevada foothills (Amador Co.) Var. agréstis Greene. Fruits

648. Echinocystis fabacea Naud.; *a*, fl. branchlet x ⅔; *b*, pist. fl. x ⅔; *c*, fr. x ⅓.

649. Echinocystis horrida Cong.; *a*, pist. fl. x ⅔; *b*, fr. branchlet x ⅙.

smaller with few short spines.—E. Contra Costa Co.

2. **E. macrocárpa** Greene. CHILICOTHE. Stems 10 to 20 ft. long; leaves usually deeply lobed, 3 to 8 in. broad; corolla saucer-shaped; fruit broadly oblong, densely spiny, 3 to 4 in. long, 2 to 3 in. in diameter; spines stout, very unequal, not very rigid, ½ to 1 (or 1½) in. long; ovary 2 to 4-celled; style obvious (½ line long), bearing 3 staminodial scales; seeds 12 to 14, oblong-cylindric, nearly terete at one end, flattened at the other, 6 to 8 (or 12) lines long, 5 to 6 lines broad.—Coastal S. Cal., n. along the coast to Monterey Co., s. to L. Cal.

3. **E. hórrida** Congdon. Fig. 649. Similar to no. 2; corolla campanulate; fruits 4 to 6 in. long, 2 to 3 in. in diameter, strongly spinose; seeds 8 to 10, oblong, one end terete, the other flattened, 1 to 1⅛ in. long, 7 to 8 lines broad.—S. Sierra Nevada foothills from Tuolumne Co. to Tulare Co. The presumed differences between this and E. macrocarpa may disappear when tested further, especially with ample series of specimens of E. horrida.

4. **E. oregàna** Cogn. HILL MAN-ROOT. Stems 4 to 25 ft. long, often climbing over trees and shrubs, mostly smooth; leaves muriculate-scabrous, especially on the upper surface, or almost smooth, reniform or round-cordate, 3 to 7 (or 9) in. broad, shallowly or deeply 5 to 7-lobed; staminate racemes 6 to 10 in. long, the pedicels (3 or) 6 to 11 lines long; corolla 6 to 7 lines broad, clear white; pistillate flowers with abortive stamens (staminodia), the pedicels 3 to 6 lines long, or in fruit to 1¾ in. long; ovary ovate, 2 or 3-celled; ovules 1 to 4 in each cell, attached to the outer side; fruit ovate, 2 to 3½ in. long, somewhat attenuate at each end, often markedly beaked at apex, nearly smooth or sparsely covered with short weak spines; spines 2 to 3 lines long, glabrous or puberulent; seeds 6, horizontally placed, nearly circular, markedly flattened, 10 to 11 lines long, 3 to 4 lines thick.—Hill country, Santa Clara Co. to Humboldt and Siskiyou Cos.; n. to Ore. (E. marah Cogn.)

5. **E. watsònii** Cogn. Stems slender, not succulent, 4 to 8 ft. long; herbage glaucous, especially on the under side of the leaves, smooth or only slightly scabrous, glabrous or nearly so; leaves orbicular-cordate or broadly reniform, 2 to 4½ in. broad, rather broader than long, deeply 5-parted, the lobes broader above and sinuately 3-lobed; staminate racemes slender, often few-flowered, the flowers small (1½ to 2½ lines in diameter), white; pistillate flowers 3 to 5 lines broad, without abortive stamens, on slender pedicels 1 to 2 in. long; ovary smooth or somewhat prickly, the prickles much dilated below the middle; fruit nearly globose, 1 to 1¼ in. in diameter, sparsely covered with weak glabrous prickles 1½ to 2½ lines long or somewhat naked toward the summit, 2 to 4-celled, 2 to 6-seeded; seeds subglobose, 7 to 9 lines long, 6 to 7 lines broad.—Sierra Nevada foothills from Amador Co. to Butte Co.; inner North Coast Ranges.

3. BRANDÈGEA Cogn.

Perennial herbs with large thick roots. Leaves 3 to 5-parted. Flowers small or minute. Corolla rotate, 5-parted almost to the base. Staminodia in the pistillate flower none. Ovary 1-celled, the filiform beak very oblique; ovule 1. Fruit narrowly obovoid, indehiscent, smooth or sparsely echinate, thin-walled. (T. S. Brandegee, student of the Mexican flora.)

1. **B. bigelòvii** Cogn. Stems slender, trailing; leaves 1 to 2 in. long, almost as if palmately 3-lobed, the basal lobes mostly very small or obsolete, the upper surface densely sprinkled with disk-like pustules; corolla 1 line long; body of fruit 2 to 2½ lines long, either smooth or with a few prickles above the middle or on the beak.—Colorado Desert; s. to L. Cal. (B. parviflora Wats.)

THYMELAEÀCEAE. Mezereum Family

Ours deciduous shrubs with simple entire alternate leaves. Flowers perfect, with corolla-like shallowly 4-cleft calyx. Stamens inserted upon the calyx, twice as many as its lobes. Corolla none. Ovary superior, 1-celled; ovule 1, pendulous.

1. DÍRCA L. Leatherwood

Flowers in fascicles from buds containing flowers and leaves. Scales of the bud yellowish or whitish, silky, forming an involucre to the flowers, soon falling. Calyx slightly oblique, tubular below, expanded into a short throat above. Stamens 8, exserted, inserted at the base of the throat. Style slender, exceeding the stamens. Fruit drupe-like, reddish. (Greek name of a celebrated fountain in Boeotia, the plants growing in moist places.)

1. **D. occidentàlis** Gray. Western Leatherwood. Fig. 650. Erect shrub 2 to 5 (or 11) ft. high, with soft pliable wood and leathery bark; leaves oval or obovatish, 1½ to 2¼ in. long; flowers yellow, in clusters of 2 or 3 from lateral and terminal buds, turned downward at an angle; calyx 4 lines long, its lobes a little erosulate; stamens commonly 8, sometimes 9, rarely 10. —N. and e. slopes of hills surrounding San Francisco Bay (Santa Cruz Mts., Oakland and Berkeley hills, Marin Co. hills). Feb.-Mar.

650. Dirca occidentalis Gray; *a*, fl. branchlet x ½; *b*, fr. branchlet x ½; *c*, fl. x 2; *d*, fr. x 2.

ELAEAGNÀCEAE. Oleaster Family

Shrubs or small trees, the foliage scurfy with scarious scales. Flowers regular. Calyx herbaceous. Corolla none. Ovary inferior, 1-celled; ovule 1; style 1, stigma 1.

1. SHEPHÉRDIA Nutt.

Shrub with silvery foliage. Leaves opposite, entire, deciduous. Flowers dioecious, nearly sessile in axillary clusters or the pistillate solitary. Staminate flower: calyx 4-parted, rotate; stamens 8, alternating with the processes of the thick disk. Pistillate flower: calyx urn-shaped, 4-cleft, the orifice closed by the teeth of the 8-lobed disk. Fruit berry-like, the membranous achene closely covered by the fleshy calyx-tube. (John Shepherd, one-time curator of the Liverpool Botanic Garden.)

1. **S. argéntea** Nutt. Buffalo Berry. Fig. 651. Stout spiny shrub or small tree 6 to 15 ft. high; thorns rigid, leafy at base; leaves silvery-scurfy below, greener above, mostly oblong, 1 to 1½ in. long, on petioles 2 to 4 lines long; berries red, oblong, 2½ to 3⅓ lines long, on pedicels ½ to 1 line

651. Shepherdia argentea Nutt.; *a*, staminate fl. branchlet x ½; *b*, long. sect. of staminate fl. x 3; *c*, pistillate fl. x 3; *d*, fr. x 2.

long.—Along streams or winter watercourses: Mt. Pinos region (Mono Creek in the San Rafael Mts., Ozena on the Cuyama River, San Emigdio Potrero); Mono and Alpine Cos.; e. to Rocky Mts.

LYTHRÀCEAE. Loose-strife Family

Glabrous herbs with entire simple leaves. Flowers perfect, axillary or whorled, in ours minute or inconspicuous. Calyx tubular, free from but enclosing the ovary, 4 to 6-toothed, sometimes with accessory teeth in the sinuses. Petals 4 to 6, inserted with the stamens on the calyx. Stigmas in ours 4 to 8. Ovary and capsule in ours 2 to 4-celled; style 1; stigma capitate, 4-lobed. Seed without endosperm.

Flowers subsessile or pediceled, solitary in the axils; calyx cylindrical; leaves alternate.....1. Lythrum.
Flowers sessile in the axils, 2 to 4 in a whorl; calyx campanulate or globose; leaves opposite.
Capsule bursting irregularly, its walls not striate; leaves sessile by an auricled base...2. Ammannia.
Capsule septicidally dehiscent, its valves densely striate transversely; leaves tapering at base or shortly petioled....3. Rotala.

1. **LÝTHRUM** L. Loose-strife

Slender herbs with 4 or 5-angled stems. Leaves sessile, in ours alternate. Flowers solitary in the axils, purple or whitish. Calyx cylindric or subcylindric, 8 to 12-ribbed, its 4 to 6 teeth thin, erect, smaller than the greenish accessory ones which are at first spreading and later erect. Petals 5 or 6, the stamens in ours as many. Capsule oblong or cylindrical, 2-celled. (Greek luthron, blood, applied either on account of the color of the flowers or the styptic properties of certain species.)

Flowers distinctly pediceled; corolla 2 to 3 lines long, bright purple; perennial.....1. *L. californicum.*
Flowers subsessile; corolla ½ to 1 line long, pale purple or almost white.
Perennial, stoloniferous.....2. *L. adsurgens.*
Annual, not stoloniferous.....3. *L. hyssopifolia.*

1. **L. califórnicum** T. & G. Common Loose-strife. Stems erect, paniculately branching above, 2 to 3 or even 6 ft. high; leaves linear-lanceolate, the lowest ovatish-oblong, ½ to ¾ or 1½ in. long; flowers distinctly pediceled; calyx narrowly vase-shaped or in fruit clavate, 2½ to 3½ lines long, its teeth sharply acute; petals 2 to 3 lines long, bright purple.—Common in low valley and marshy lands and about springs in the foothills: Coast Ranges, Great Valley, Sierra Nevada foothills and coastal S. Cal.

2. **L. adsúrgens** Greene. Stems several from the root-crown, decumbent or assurgent, 1 to 3 ft. long; herbage pallid, slightly succulent; calyx cylindric, 2 to 2½ lines long, 12-ribbed, the ribs in maturity widened and thickened below; accessory teeth minute, subulate; petals pale purple or almost white, minute (½ to ¾ line long).—Low wet places in valley and mountain flats: Santa Clara Co. to the Sacramento Valley and Siskiyou Co. Perhaps a robust perennial variety of no. 3.

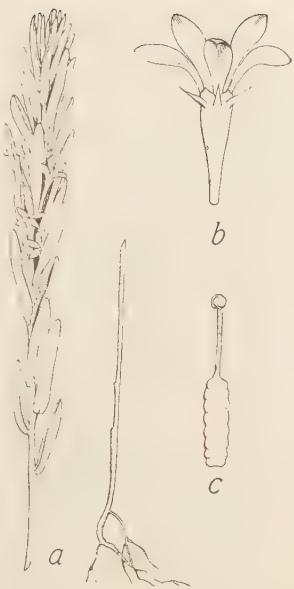
3. **L. hyssopifòlia** L. Fig. 652. Grass Poly. Stems erect, slender and simple or with several branches from below the middle, 4 to 9 in. or even 2 ft. high; herbage pale, glabrous; leaves linear to oblong, 3 to 7 lines long; flowers subsessile in the axils; calyx 2 lines long; petals ¾ to 1 line long,

pale purple or whitish.—Hillside hollows or beds of former pools in the valleys, throughout Cal.; all continents. May-Sept.

2. AMMÀNNIA L.

Annuals with mostly 4-angled stems. Leaves opposite, sessile by an auricled base. Flowers purplish, 1 to 5 in each axil. Calyx campanulate (in fruit globose or nearly so), the tube 8-ribbed, 4-toothed and usually with small accessory teeth in the sinuses. Petals 4, purplish, small and deciduous, or wanting. Stamens in ours 4. Capsule globose, bursting irregularly. (Johann Ammann, a German botanist of the 18th century.)

1. **A. coccínea** Rottb. Erect, simple or branching below, 4 to 14 in. high; leaves horizontally spreading, broadly linear or somewhat narrowed towards the apex, 1 to 2 in. long, sessile by a broad auricled base; flowers in whorls of 2 to 5; petals purple, roundish, ½ to 1 line long, fugacious; calyx in flower narrowly campanulate, strongly 8-ribbed, in fruit globose-distended and the ribs less obvious; capsule 2 lines long.—Lowlands along rivers: Great Valley; S. Cal.; e. to N. J., s. to Brazil.



652. Lythrum hyssopifolia L.; *a*, habit x ¾; *b*, fl. x 3; *c*, pistil x 6.

3. ROTÀLA L.

Annuals similar to Ammannia. Flowers 1 or 2 in each axil. Petals in ours 4. Stamens 4. Capsule septicidal. (Latin rota, wheel, the leaves whorled in some species.)

1. **R. ramòsior** Koehne. Tooth-cup. Slender, 2 to 3 (or 7) in. high; leaves linear-oblanceolate, tapering at base and thus sometimes short-petioled, 4 to 7 lines long; flowers 1 to 3 in each axil; petal ovate, acuminate, ⅔ line long; stigma subsessile.—Wet lowlands, San Joaquin Valley; N. Am., S. Am.

ONAGRÀCEAE. Evening Primrose Family

Herbs. Leaves simple, entire, toothed, lobed or divided. Flowers mainly showy, borne in spikes or racemes, or solitary. Calyx-tube adnate to the ovary, the petals inserted at its summit, and the stamens twice as many or as many. Calyx-lobes 4 (sometimes 5 or 2). Petals 4 (sometimes 5 or 2). Pollen commonly cobwebby. Ovary 4 (sometimes 5 or 2)-celled; style 1; stigma capitate or discoid, or 4-lobed. Fruit a capsule, rarely bur-like or indehiscent. Seeds mostly small, naked or with a tuft of hairs at apex (coma); endosperm none.

A. Calyx-limb divided down to the ovary and persistent on the fruit after flowering; parts of the flowers in 4s or 5s; fruit a capsule (indehiscent in no. 1).

Petals 5, 6 to 7 lines long; fruit at length reflexed.....1. Jussiaea.
Petals none or minute; fruit erect.....2. Ludwigia.

B. Calyx-limb deciduous after flowering.

Parts of the flowers in 4s.
Fruit a capsule, dehiscent.
Ovary 4-celled; calyx-tube produced above the ovary.
Seeds with a tuft of hairs at one end.
Flowers large; corolla and calyx scarlet.....3. Zauschneria.
Flowers small; corolla white, red or purplish.....4. Epilobium.
Seeds naked.
Anthers innate (attached at or near the base); flowers purple, rose-color or white, never yellow.
Calyx-lobes erect or ascending; petals small or minute.....5. Boisduvalia.
Calyx-lobes reflexed or the tips remaining united and turned to one side in anthesis.
Petals distinctly clawed, often much lobed.....6. Clarkia

Petals sessile, not lobed (except in one species); stamens 8.. 7. GODETIA.
Anthers versatile (attached near the middle); flowers yellow or white.
Calyx-tube 1 line to 5½ in. long; anthers all alike.... 8. OENOTHERA.
Calyx-tube none or scarcely evident; alternate anthers of different shape.... 9. EULOBUS.
Ovary 2-celled; calyx-limb divided down to the ovary; flowers white or pink.... 10. GAYOPHYTUM.
Fruit indehiscent.... 11. GAURA.
Parts of the flowers in 2s; fruit bur-like.... 12. CIRCAEA.

1. JUSSIAÈA L.

Glabrous perennial herbs, ours aquatic or of muddy shores. Leaves alternate. Flowers yellow, solitary in the axils, pediceled. Calyx-tube elongated, not produced beyond the ovary, its lobes 5. Petals 5. Stamens twice as many. Fruit (in ours) 5-celled. Seeds very numerous. (Bernard de Jussieu, who founded the natural system of classification.)

1. **J. californica** Jepson. YELLOW WATER-WEED. Fig. 653. Stems 1 to 10 ft. long; leaves oblong to obovate, ⅞ to 2 in. long, the floating ones elliptic or orbicular and with longer petioles; calyx-lobes lanceolate, ½ in. long; petals broadly obovate, 6 to 7 lines long; fruit woody, cylindric, 10 lines long, indehiscent, at length reflexed and the calyx-segments deciduous from the mature fruit; fruiting pedicel ½ to ¾ in. long; seeds large for the order, with a very thick tough outer coat.—Rivers, streams and lakes, 5 to 1500 ft.: widely distributed in cismontane Cal.

653. Jussiaea californica Jepson; *a*, fl. stem x ½; *b*, and *c*, pods x 1.

2. LUDWÍGIA L. FALSE LOOSE-STRIFE

Aquatic or marsh perennial herbs, with the aspect of Jussiaea, but the leaves (in ours) opposite, parts of the flower in 4s, and the petals often absent. Stamens as many as the petals and alternate with them. Ovary broad at apex and usually flattened, or crowned with a conical style-base. Capsule 4-celled, dehiscent by lateral slits or terminal pores. Seeds minute. (C. G. Ludwig, 1709-1773, Professor of Botany at Leipsic.)

1. **L. palústris** Ell. WATER PURSLANE. Stem 6 to 12 in. long; herbage glabrous; leaves obovate, acute or acuminate, narrowed at base into a rather long petiole, the whole leaf 8 to 13 lines long; petals none, or minute and reddish; capsule erect, broadly oblong, 1½ to 2 lines long, more or less 4-sided or -angled, a narrow longitudinal band of low tubercles on each side, yellowish, the persistent sepals green. Muddy shores or low overflowed lands: Glen Ellen; Healdsburg; Lakeport; Oroville; Oro Fino, Siskiyou Co.; Sierra Co.; e. to the Atlantic, n. to Can.; Eur.

3. ZAUSCHNÈRIA Presl

Low perennials with alternate leaves (the lowest opposite) and large scarlet Fuchsia-like flowers. Calyx above the ovary colored like the corolla, its tube funnelform with a globose base (nectar-bearing within), and appendaged within at the most constricted portion with several erect and deflexed scales. Petals inserted on the throat of the calyx and rather shorter than its erect lobes, obcordate or 2-cleft. Stamens 8, exserted, colored like the corolla; anthers linear-oblong, attached by the middle. Style long and exserted; stigma 4-lobed. Capsule linear, obtusely 4-angled, 4-valved and imperfectly 4-celled. Seeds oblong, with a tuft of hairs at the apex. (M.

Zauschner, a Bohemian botanist, one time Professor of Natural History in the University of Prag.)

Leaves linear to linear-lanceolate, the lateral veins commonly not evident; calyx-tube not veiny or not markedly so.
Petals exceeding calyx-lobes; leaves (1 or) 1½ to 4 lines wide.....1. *Z. californica.*
Petals shorter than calyx-lobes; leaves ¼ to 1 line wide.....2. *Z. cana.*
Leaves ovate to ovate-lanceolate, 4 to 9 lines wide, the lateral veins usually obvious; calyx-tube commonly with prominent longitudinal veins.....3. *Z. latifolia.*

1. **Z. californica** Presl. MEXICAN BALSAMEA. Fig. 654. Stems decumbent or suberect, ½ to 2½ ft. high, usually simple and leafless below, but leafy and commonly with short opposite branches above; bark tending to exfoliate below; herbage green-pubescent, often a little glandular; leaves linear or lanceolate-linear, entire or somewhat denticulate, lateral veins usually not evident, greenish or canescent, ½ to 1¼ in. long; flowers 1 to 1½ in. long above ovary, disposed in few-flowered spikes. — Dry benches, rocky hillsides or cliffs, 50 to 4000 ft.: Coast Ranges from Mendocino and Lake Cos. to coastal S. Cal. (Z. eastwoodae Moxley.) Variable species, passing by intergrades into no. 3. Var. VILLÒSA Jepson n. comb. Herbage white-tomentose.—Coast Ranges; S. Cal. (Z. villosa Greene.)

654. Zauschneria californica Presl; *a*, fl. branchlet x ⅔; *b*, long. sect. fl. x ¾.

2. **Z. càna** Greene. Leaves fascicled in the axils, linear or linear-filiform, 3 to 10 lines long; herbage tomentose-canescent, not glandular.—Dry hills near the coast, 100 to 1800 ft.: San Luis Obispo to Los Angeles; Santa Barbara Isls. (Z. californica var. microphylla Gray.)

3. **Z. latifòlia** Greene. Stems 4 to 14 in. high; leaves ovate, oblong-ovate or elliptical, usually rounded at base, commonly denticulate, lateral veining usually evident, ¾ to 1¾ in. long; herbage green, thinly villous, often viscid; flower above ovary 10 to 16 lines long.—Montane, 5000 to 9300 ft.: e. Mendocino Co. to n. Humboldt Co.; Sierra Nevada from Plumas Co. to Tulare Co.; s. to San Gabriel, San Jacinto and Santa Rosa mountains. (Z. glandulosa and hallii Moxley. Z. elegans, velutina and canescens Eastw.) Var. TOMENTÉLLA Jepson n. comb. Leaves ovate to lanceolate, 8 to 15 lines long, 3 to 6 lines wide; herbage white-villous; flower above ovary 10 to 12 lines long.—Montane, 4000 to 8500 ft.: Sierra Nevada from Placer Co. to Mariposa Co. (Z. tomentella Greene.) Var. VISCÒSA Jepson n. comb. Herbage extremely viscid; leaves ovate, abruptly acute.—San Gabriel Mts. (Z. viscosa Moxley.)

4. EPILÒBIUM L. WILLOW HERB

Herbs; annual, perennial by creeping rootstocks, or propagating in the autumn by offsets. Leaves opposite or alternate. Flowers purple, rose-color or white, borne in racemes. Petals 4, often emarginate or bifid. Stamens 8, the 4 alternate shorter. Stigma oblong or 4-lobed. Ovary long and narrow, 4-celled. Capsule 4-valved. Seeds numerous, the summit bearing a tuft of long hairs (coma). (Greek epi, upon, lobus, a pod, and ion, a violet.)

A. Calyx-tube divided down to the ovary or essentially so; flowers large, the petals 5 to 9 lines long, entire, spreading; stigma 4-cleft; capsules long-pedicelled; leaves alternate; perennials with stout horizontal rootstocks.—Subgenus CHAMAENERION.

Racemes many-flowered, elongate, not leafy; petals purple; leaves green above but pale and veiny below.....1. *E. angustifolium.*
Racemes few-flowered, short, very leafy; petals rose-color; leaves pallid and veinless on both surfaces.....2. *E. latifolium.*

B. Calyx-tube prolonged a little beyond the ovary; petals ascending.—Subgenus EUEPILOBIUM.

Perennials; leaves opposite or mainly so (often more or less alternate in no. 9).
Flowers large, the petals ½ to 1 in. long; stigma with oblong lobes; low plants; high montane.....3. *E. obcordatum.*
Flowers small, the petals 1 to 6 lines long; stigma entire or rarely lobed.
Leaves tipped with a brown subulate gland; stem arising from a short woody caudex; xerophilous.....4. *E. nivium.*
Leaves not gland-tipped.
Plants pallid, glabrous and glaucous.....5. *E. glaberrimum.*
Plants green and not at all glaucous.
Rootstocks not producing fleshy-scaly buds.
Stems 2 to 12 in. high, simple, stoloniferous; high montane.
Stems curved or ascending from a creeping base; leaves ovate or elliptic-oblong with a short petiole, 2 to 4 lines wide; flowers nodding in bud.6. *E. anagallidifolium.*
Stems erect, straight.
Leaves elliptic or oblong-ovate, thin, bright green, distinctly though shortly petioled, 4 to 8 lines wide.....7. *E. alpinum.*
Leaves linear to oblong or ovate-oblong, thicker, dark green, sessile, ¾ to 2 lines wide.....8. *E. oregonense.*
Stems 1 to 4 ft. high, almost always branched above, not stoloniferous; foothills and lower valleys; hydrophilous.
Stems reddish; leaves mainly opposite; petals 3 to 5 lines long; coastal.....9. *E. watsonii.*
Stems greenish or light-colored; leaves opposite or the upper mostly alternate; petals 1½ to 2½ lines long; mostly interior.....10. *E. californicum.*
Rootstocks producing fleshy-scaly globose winter buds; plants simple-stemmed; herbage commonly glabrous....11. *E. brevistylum.*
Annuals; stems with shreddy bark; xerophilous plants.
Plants 2 in. to 1½ ft. high, more or less pubescent; stem simple or equally branched throughout; calyx-tube less than ½ line long; leaves opposite.....12. *E. minutum.*
Plants 1½ to 5 ft. high, glabrous, at least below; stem paniculately branched above; calyx-tube 1 to 2 lines long.....13. *E. paniculatum.*

1. **E. angustifòlium** L. FIRE-WEED. Fig. 655. Stem erect, mostly simple, 2 to 6 ft. high, glabrous, or puberulent above; leaves lanceolate, nearly entire, lateral veins confluent in submarginal loops, 4 to 6 in. long, sessile or nearly so, or the lower short petioled; flowers large, in long racemes with small slender bracts; calyx cleft almost to the ovary; corolla slightly irregular, lilac-purple; petals 5 to 8 lines long, entire or slightly emarginate; stamens purple, in a single row, with filaments dilated at base; style exceeding the stamens, hairy at base, at first recurved; capsule 2 to 3 in. long.—Moist or boggy ground, especially in fire-swept areas: Sierra Nevada and s. to the Cuyamaca Mts., 2000 to 6600 ft.; North Coast Ranges, 50 to 3000 ft.; n. N. Am.; Eur.

655. Epilobium angustifolium L.; *a*, fl. stem; *b*, capsule x ⅓.

2. **E. latifòlium** L. Stems few, stout, commonly branched, ½ to 2 ft. high, erect or ascending from a short caudex, puberulent above; leaves lanceolate to elliptic-ovate, rather coriaceous, glaucous and veinless on both surfaces, entire, sessile or nearly so, ¾ to 2 in. long; racemes short, few-flowered, very leafy; petals purple, 6 to 10 lines long; style much shorter than the stamens; stigma-lobes oblong; capsules 2 to 3 in. long.—Wet ground, subalpine (8000 to 9000 ft.), e. side Sierra Nevada in Mono Co.; Sonora Pass; Lundy; rare in Cal.; Alas. to Quebec and Col.

3. **E. obcordàtum** Gray. ROSE EPILOBIUM. Stems simple, decumbent, several from the slightly soft-woody base, 2 to 6 in. long; herbage glabrous and frequently glaucous; leaves ovate, obscurely denticulate, 5 to 9 lines long, crowded or approximate, sessile or on very short winged petioles; flowers 1 to 4 in the axils of the scarcely reduced upper leaves; petals bright rose-purple, roundish-obovate, obcordately 2-lobed, 6 to 10 lines long; anthers yellow, on purplish filaments; style purplish; capsules 1 to 1¾ in. long, comparatively few-seeded.—Alpine or subalpine slopes, 8000 to 13,000 ft.: Sierra Nevada from Tulare Co. to Nevada Co. and n. to Siskiyou and Modoc Cos.; e. to Nev. Var. PUBÉRULUM Jepson n. var. Stems and sometimes the leaves minutely puberulent.—Range of the species (Silver Pass, Fresno Co., A. L. Grant 1534, type).

4. **E. nìvium** Bdg. Stems erect, tufted on a shortly branched woody caudex, 5 to 10 in. high; herbage finely short-villous; leaves elliptic to linear or lanceolate, coriaceous and not at all veiny, entire, a subulate brown gland at apex, 3 to 7 lines long, narrowed to a short petiole; raceme few-flowered, the subtending leaves much reduced; calyx-tube 2½ to 3½ lines long; petals violet-purple, notched at the apex, 3 to 5 lines long; stigma 4-notched; capsule stoutish, 5 to 6 lines long.—Shaly slopes, high montane, 7000 to 8000 ft., inner North Coast Range: Snow Mt.; St. John's Peak; South Yollo Bolly.

5. **E. glabérrimum** Barbey. Stems slender, erect, unbranched or occasionally with a few short strict laterals, (½ or) 1 to 3 ft. high, arising from branching scaly rootstocks; herbage pallid, glabrous, very glaucous; leaves oblong-lanceolate to linear, entire or essentially so, 1 to 2½ in. long, mostly rather closely ascending, sessile or the lowermost very short-petiolate; petals pale lavender or nearly white, 2 to 4 lines long.—Springy ground in the mts., 3000 to 10,000 ft., throughout Cal.; n. to Wash. and Ida., e. to western Nev. Var. FASTIGIÀTUM (Nutt.) Trel. Stems 8 to 12 in. high; leaves broader and tending to be shorter.—High montane, Tulare Co.

6. **E. anagállidifòlium** Lam. Stems simple, erect or decumbent at base, 2½ to 6 in. high, producing stolons at base; herbage glabrous or the stems with pubescent lines; leaves elliptic or oblong to narrow-ovate, obtuse, entire, 2 to 5 lines long, contracted to a short but distinct petiole; racemes nodding at first; petals lilac or purple, 1 to 1½ lines long; racemes maturing 1 to 4 capsules.—High montane, 9000 to 10,400 ft.: Farewell Gap and Mt. Silliman in Tulare Co.; Eagle Peak, Warner Mts.; e. to Col., n. to arctic Am.; Eur., Asia.

7. **E. alpìnum** L. Stems slender, erect, simple but several to many from the rootstock, 4 to 12 in. high, stoloniferous; herbage glabrous; leaves elliptic or oblong-ovate, mostly obtuse, entire or obscurely denticulate, very thin, bright green and glabrous, ¾ to 1½ in. long, narrowed to a petiole 1 to 2 lines long, somewhat spreading; petals white or pinkish, 1½ to 2½ lines long; racemes maturing 1 to 6 (or 9) capsules.—Wet ground, 6000 to 8300 ft.: Sierra Nevada from Tulare Co. to Siskiyou Co.; n. to Alas.; circumpolar.

8. **E. oregonénse** Hausskn. Stems simple, slender, erect, 3 to 6 (or 9) in. high, stoloniferous, the leaves more or less crowded below, reduced and sparse above; herbage glabrous; leaves linear to oblong or ovate-oblong, usually obtuse, sessile with a more or less rounded base, usually entire or rarely obscurely denticulate, 3 to 8 lines long; petals cream-color or pink, deeply emarginate, 2 to 3½ lines long; racemes maturing usually 1 to 4 capsules.—Boggy ground in the higher mts., 5300 to 8000 ft.: San Jacinto Mts.; Yosemite region; Yollo Bolly Mts.; Ore. to B. C.

9. **E. watsònii** Barbey. Stems rather stout, erect, simple below though more or less branched above, usually reddish, shortly pilose-pubescent and sometimes glandular above, 2 to 4 ft. high, producing in the late fall rosettes of foliage leaves that are sessile at the base of the stem or on short scaly shoots; leaves prevailingly opposite, oblong-lanceolate to narrowly ovate, serrulate, the base round with a short petiole or subsessile, commonly about 2 (1 to 3) in. long; racemes very floriferous, leafy, elongate; petals red-purple or paler, deeply emarginate, 3 to 5 lines long.—Sonoma Co. coast

656. Epilobium watsonii var. franciscanum Jepson; *a*, fl. branchlet x ½; *b*, seed with coma x 2½.

Var. FRANCISCÀNUM Jepson n. comb. Fig. 656. Herbage glabrate; inflorescence densely compact or loose.—Low or moist ground near the coast, Monterey Co. to Humboldt Co. (E. franciscanum Barbey.)

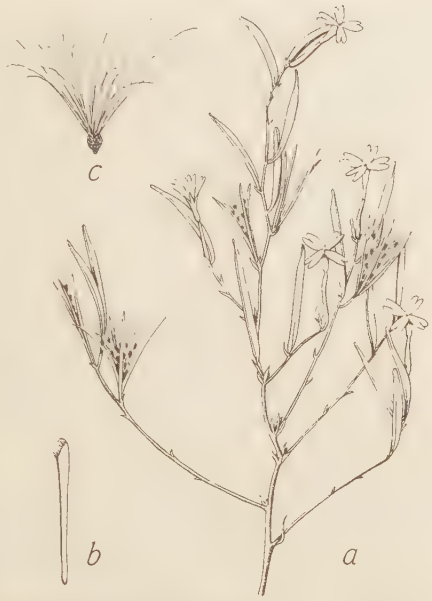
10. **E. californicum** Hausskn. Stem slender, not colored, 2 to 4 ft. high, remotely leafy; herbage glabrous or whitish-pubescent above; leaves lanceolate or oblong-lanceolate, denticulate, 1 to 3 in. long, short-petioled or subsessile, passing into the small floral ones; flowers small; petals white, 1 to 1½ lines long; capsule slender, nearly glabrous, short-pediceled.—Springs and low ground, Coast Ranges, Great Valley, Sierra Nevada foothills. Var. EXALTÀTUM Jepson n. comb. Stems slender; flowers large, the petals becoming 4 to 5 lines long.—Sierra Nevada, 3800 to 7000 ft., n. to Siskiyou Co., thence s. to n. Humboldt Co. at 2500 ft. (E. exaltatum Drew.) Var. OCCIDENTÀLE Jepson n. comb. Pubescence more or less glandular, especially on the branches.—Wet ground, valleys and mountains, middle and n. Cal. (E. adenocaulon var. occidentale Trel.) Var. PARÍSHII Jepson n. comb. Buds white-tomentose.—Valleys of coastal S. Cal. and adjacent cañons. (E. parishii Trel.) Var. HOLOSERÍCEUM Jepson n. comb. Canescent throughout with a dense short pubescence.—Moist ground, lower valleys, San Diego to Butte Co. Intergrading completely with the species. (E. holosericeum Trel.)

11. **E. brevistylum** Barbey. Stems erect, simple or usually at most with one or two inconspicuous laterals above, 1 to 1⅔ or occasionally 2½ ft. high; rootstocks producing globose or ovoid winter buds, the scales of which are thick and fleshy and which frequently persist as a series of cotyledon-like scales at the base of the stem developing from the bud; herbage glabrous, rarely finely pubescent; leaves narrow-ovate to oblong- or linear-lanceolate, finely denticulate, sessile, base rounded, ascending or suberect, 1 to 2¾ in. long; petals purplish or white, emarginate, 1½ to 2½ lines long.—Wet ground in the pine belt, 5000 to 8500 ft., throughout Cal.; n. to Wash., e. to Col. In foliage much suggesting a low simple-stemmed form of the E. watsonii group but differing widely from it in its innovations. Var. URSÌNUM Jepson n. comb. Leaves more pronouncedly lanceolate, more remotely and distinctly serrate.—With the species. (E. ursinum Parish.) Var. PRINGLEÀNUM Jepson n. comb. Low, about 4 to 6 in. high; leaves linear-oblong or linear-lanceolate, entire or inconspicuously denticulate, usually 4 to 6 times as long as wide, sessile, marked by a dense short dull-colored pubescence.—Wet soil, Sierra Nevada from Tulare Co. to Siskiyou Co.; n. to Wash. Apparently not common. (E. pringleanum Hausskn.) Var. TÉNUE Jepson n. comb. Like the last variety but the herbage glabrous or glabrate.—Little Yosemite; Donner Pass. (E. delicatum Trel. var. tenue Trel.)

12. **E. minùtum** Lindl. Stems simple or subsimple and erect, or with many ascending opposite branches, 2 to 14 in. high; herbage puberulent; leaves lanceolate or oblanceolate, thickish, rather remote, entire or remotely denticulate, 4 to 10 lines long, tapering to a distinct petiole; flowers distributed along the stem in the axils of the reduced leaves; calyx-tube less than ½ line long; petals rose-color or white, emarginate, 1 to 2½ lines long; capsule arcuate, short-pediceled or even sessile.—Dry or rocky

slopes, often in chaparral, 100 to 4500 ft.: Mariposa Co. to Modoc Co.; San Benito Co. to Siskiyou Co.; n. to B. C. Var. BIOLÉTTII Greene. Plants 12 to 16 in. high, of strict growth; flowers minute, the petals ½ to ⅔ line long.—Coast Ranges from Santa Clara Co. to Humboldt Co.; Calaveras Co.

13. **E. pániculàtum** Nutt. Fig. 657. Stem simple below, paniculately branched above, 1½ to 3 or even 6 ft. high; herbage glabrous throughout, sometimes glandular-puberulent on the inflorescence; leaves lanceolate to linear, mostly alternate, with smaller ones fascicled in the axils, sharply but minutely denticulate, mostly veined, 1¼ to 2½ in. long, usually early deciduous; flowers many to numerous, racemose on the filiform nearly leafless branches of the panicle, the bracts almost subulate; petals deeply 2-cleft into linear-oblong lobes, rotate-spreading, rose-purple, 3 to 5 lines long; capsule pediceled, 10 to 12 lines long, sharply 4-angled and acuminately beaked.—Open dry ground everywhere, 10 to 5500 ft., throughout Cal.; n. to B. C., e. to Col. and Ariz.



657. Epilobium paniculatum Nutt.; *a*, fl. branchlet x ½; *b*, style x 2½; *c*, seed x 2.

Var. JUCÚNDUM Trel. Flowers large, the petals 5 to 8 lines long.—Humboldt Co. to Siskiyou Co.; n. to Wash.

658. Boisduvalia densiflora Wats.; *a*, fl. branchlet x ½; *b*, fl. x 2½; *c*, capsule x 2½.

5. **BOISDUVÀLIA** Spach

Erect annuals with alternate leaves. Flowers small or minute, in leafy spikes or axillary along the branches. Calyx-tube (above the ovary) short, obconic, the lobes erect. Petals 4, obovate, sessile, 2-lobed, purple to white. Stamens 8, those opposite the petals shorter; anthers basifixed. Capsule 4-celled, 4-valved, sessile. (Jean-Alphonse Boisduval, French naturalist and physician, author of Flora Francaise.)

Capsule terete, membranous.
Capsule septifragal, the septa wholly persistent on the placental axis, which is thus 4-winged. . 1. *B. densiflora.*
Capsule loculicidal, the septa adherent to the valves in dehiscence.
Floral leaves ovate or oblong. . . . . 2. *B. glabella.*
Floral leaves linear. . . . . 3. *B. stricta.*
Capsule 4-sided, coriaceous; dehiscence unknown. 4. *B. cleistogama.*

1. **B. densiflòra** (Lindl.) Wats. Fig. 658. Stem erect, 1 to 5 ft. high, branched above; leaves lanceolate, 2 in. long, the floral ovate, acute, about 3 to 6 lines long; inflorescence spicate, commonly elongated; petals about 2 lines long, about

twice as long as the lobes of the calyx, and exceeding the subtending leaves; capsule 2 lines long, dehiscent; seeds ovate or triangular-ovate. — Low ground, where water stood in spring pools, 10 to 4000 ft.: San Bernardino Mts.; Coast Ranges; Great Valley; Sierra Nevada foothills; n. to Wash., e. to Nev. June-Sept. Var. IMBRICÀTA Greene. Bracts densely imbricated, concealing the capsules; spikes commonly very long and virgate.—Santa Cruz; Marin Co.; Vaca Valley. Var. MONTÀNA Jepson. Short lateral spikelets numerous below the short terminal spike, each spikelet subtended by a narrowly lanceolate bract 1½ to 2 in. long.—Howell Mt. Var. BIPARTÌTA Jepson. Herbage pale, villous; petals white, parted into 2 unequal lobes. - N. end Mt. Hamilton Range.

2. **B. glabélla** Walp. Stem commonly branched from the base, 5 to 9 in. high; herbage glabrous or nearly, the foliage bright green; leaves lanceolate to ovate, 5 to 7 lines long; petals 2 lines long, purple; stamens opposite the sepals 1½ lines long, the alternate ones shorter (sometimes with nearly sessile anthers); capsule almost straight, pointed at apex, 3 lines long; seeds fusiform, about 60.—N. Cal. (Modoc and Siskiyou Cos.); n. to Wash. Var. CAMPÉSTRIS Jepson. Herbage more or less pubescent; upper portion of branches densely imbricated with leaves, in fruiting stage concealing the capsules.—Beds of former vernal pools in valleys, 20 to 500 ft.: coastal S. Cal.; Great Valley. May-June.

3. **B. stricta** (Gray) Greene. Stems simple or often diffusely branched from the base, frequently flowering from the very base, 5 to 13 in. high, pilose-pubescent or somewhat canescent; branches often with sparse foliage, or the foliage strict; leaves linear, ½ to 1½ in. long; petals 1 line long, violet; capsule slender, attenuate, arcuate-recurved, 6 to 7 lines long, not promptly dehiscent.—Moist spots in the valleys or hill flats, 50 to 2000 ft.: Coast Ranges from Monterey Co. to Mendocino and Lake Cos.; Sacramento Valley; s. Sierra Nevada. June.

4. **B. cleistógama** Curran. Stem commonly with stout rigid whitish branches or rarely simple, 4 to 8 in. high; herbage pilose-pubescent, somewhat glandular, glaucescent; leaves linear or lanceolate, 1 to 1½ in. long, remotely denticulate; flowers axillary along the branches, the earliest fertilized in the bud and never expanding, the later light pink; petals 2 lines long, bifid; capsule 4-sided, sharply angled, sharply pointed, the septal lines on each side distinct, 5 lines long, hard coriaceous, very tardily dehiscent, if ever.—Beds of former vernal pools, 20 to 500 ft.: Great Valley. May.

6. **CLÁRKIA** Pursh

Annuals with brittle stems and alternate leaves. Flowers showy, in terminal racemes (nodding in the bud). Calyx-tube above the ovary short and obconic, or long and slender, its lobes reflexed in flower, or remaining united and turned to one side. Petals 4, purple or rose-color, with claws, the limb entire or lobed, widespreading. Stamens 8, those opposite the petals short or rudimentary. Ovary 4-celled; style elongated, the stigma with 4 broad lobes. Capsule linear, or attenuate above, straight or somewhat curved, coriaceous, with very smooth sides, somewhat 4-angled, 4-valved. Seeds numerous, angled or margined.—The lower leaves in this and in the two succeeding genera often disappear very early. (Captain Clark of the Lewis & Clark party, first expedition across the Rocky Mts. to the Pacific, 1806.)

Stamens 8; calyx-tube short, obconical.
- Petals entire.
  - Claw very short, much shorter than limb of petal.
    - Filaments without scales; claw slender, not toothed.....1. *C. modesta.*
    - Filaments with whitish hairy scales at base, those alternate the petals with longer scales; claw broad, often toothed.....2. *C. rhomboidea.*
  - Claw about as long as limb of petal, not toothed.....3. *C. elegans.*
- Petals lobed.
  - Petals 2-lobed with a subulate tooth in the sinus; claw short, not toothed..... 4. *C. xantiana.*
  - Petals 3-lobed; claw long, a tooth on each side at the middle.....5. *C. pulchella.*

Stamens 4; calyx-tube elongated, filiform; petals 3-lobed.
- Petals 3-lobed, the lobes nearly equal.....6. *C. concinna.*
- Petals fan-shaped and obcordate, a linear or spatulate lobe proceeding from the deep sinus and exceeding in length the lateral lobes, which are several times larger.....7. *C. breweri.*

1. **C. modésta** Jepson n. sp. Stems slender, simple or strictly branched above, 13 to 15 in. high; herbage glabrous or the stems minutely puberulent; leaves linear-lanceolate, 9 to 11 lines long; racemes few-flowered; petals pink, oblong, very acute, 4 lines long, narrowed at base to a short but slender and distinct claw.—San Carlos Range (Waltham Creek, Jepson 2690, type). This is the most primitive species yet made known in Clarkia and forms a connecting link with Godetia.

659. C. rhomboidea Dougl.; fl. x 1.

2. **C. rhomboidea** Dougl. Fig. 659. Stem erect, 1 to 3 ft. high, simple or branching; herbage finely puberulent; leaves oblong to ovate, entire, ½ to 2 in. long, on petioles ½ in. long, more or less; calyx-tube above ovary 1½ lines long; calyx-lobes narrowly linear, carinate; petals rose-purple, often purple-dotted toward the base, rhomboidal, 3 to 5 lines long, the limb with a short broad often toothed claw; filaments with whitish hairy scales at base, those alternating with the petals with longer scales; capsule sessile or very shortly pediceled, commonly somewhat curved, appressed-puberulent, 1 in. long.—Cañon sides, often where there is sliding surface soil, 3000 to 7000 ft.: mts. of S. Cal.; Coast Ranges; Sierra Nevada; n. to Wash., e. to Nev.

3. **C. élegans** Dougl. Fig. 660. Stem erect, simple or branching, 1 to 3 ft. high; herbage glabrous, glaucous, often reddish; leaves ovate to oblong-ovate, entire or sometimes repand-denticulate, 1 to 1¾ in. long, short-petioled; calyx-lobes broadly linear, plane; petals often spreading laterally in pairs, about 8 lines long, the limb about equaling the narrow entire claw; filaments with a reddish densely hairy scale at base, most developed opposite the short stamens; anthers of long stamens bright crimson, 3 lines long; anthers of short stamens commonly white; capsule usually curved, sessile, 7 to 12 lines long, hirsute with spreading hairs. — Cañon sides and chaparral slopes, 200 to 3000 ft.: Mendocino Co. to mts. of S. Cal.; Sierra Nevada foothills.

660. Clarkia elegans Dougl.; *a*, fl. stem x ½; *b*, *c*, stamens x 2; *d*, capsule x 1.

4. **C. xantiàna** Gray. Stem 1 to 2¼ ft. high; herbage glabrous, glaucous; petals 2-lobed, with a subulate lobe in the sinus; capsule slender, rather strict and nearly straight, puberulent, 10 to 11 lines long.—Region of Fort Tejon.

5. **C. pulchélla** Pursh. Stems simple or rather strictly branched, 6 to 13 in. high; leaves linear- to filiform-lanceolate, ¾ to 1¼ in. long; petals pink, 3-lobed, 5 to 10 lines long, the claw about half as long as the blade and bearing a tooth at the middle on each side; long stamens with a scale on each side at base, the short stamens with rudimentary anthers.—Plumas Co. (acc. Fl. Fr. 223, but needs confirmation); ne. Ore. to B. C. and Mont. June-July.

6. **C. concínna** (F. & M.) Greene. Red Ribbons. Fig. 661. Stems simple below or diffusely much branched from the base, ½ to 2 ft. high; herbage nearly glabrous; leaves ovate-oblong to oblong, ¾ to 1½ in. long; calyx-tube above ovary 8 lines long; calyx-lobes crimson, linear-lanceolate, 9 lines long, abruptly recurved from the middle; petals rose-purple, 7 to 12 lines long, cuneate-obovate, 3-lobed, 3 upper petals are commonly approximate

661. Clarkia concinna Greene.; *a*, fl. stem x ½; *b*, anther x 6; *c*, capsule x 1.

and ascending, the lower one opposite these and declined, thus making a corolla which is physiologically irregular and as if 2-lipped; filaments not at all or scarcely dilated at base or apex, the anthers recurved after dehiscence and sparsely short-ciliate; capsule sessile, nearly straight, ¾ to 1 in. long; seeds short subcylindric, pointed at one end, the other end oblique and margined with a dense row of short teeth. — Wooded districts, especially on hillslopes where the surface soil is loose or sliding, 50 to 2000 ft.: Coast Ranges from Humboldt and Colusa Cos. to Santa Barbara Co. May-June. The common name received from Julia Harbison.

7. **C. brèweri** (Gray) Greene. FAIRY FANS. Stems with few and spreading branches, 5 to 9 in. high; calyx-tube above ovary 1 to 1¼ in. long; petals luminous pink, fan-shaped and obcordate, about 1 in. long, the rather deep sinus with a linear or spatulate lobe proceeding from it which surpasses the large lateral lobes; filaments clavate- or globose-dilated at apex; anthers linear, brick-red, 3 lines long, conspicuously ciliate; style much longer than the stamens; stigmas white; capsule stout, sessile, straight, 1¼ in. long; seeds as in no. 6.—Loose shale slopes, 2000 to 3000 ft.: Mayacamas Range; e. side Santa Cruz Mts.; Mt. Hamilton Range; San Carlos Range. (Eucharidium breweri Gray.)

7. GODÈTIA Spach

Mostly erect annuals with narrow shortly petioled or sessile alternate leaves. Flowers showy, red, purple, cream-color or nearly white, opening during the day, disposed in leafy racemes or spikes, the inflorescence sometimes reduced to but few flowers or a single one. Calyx often colored, its lobes reflexed in anthesis, or united and turned to one side; calyx-tube obconic or funnelform. Petals 4, commonly broad and entire, sometimes notched or 2-lobed. Stamens 8, those opposite the petals shorter; anthers basifixed. Capsule linear, rarely ovate, 4-sided or terete, often longitudinally ribbed, 4-celled, 4-valved. Seeds in 1 or 2 rows. (C. H. Godet, 1797-1879, author of Flora de Jura.)

A. Flowers loosely spicate; capsule commonly terete, sometimes ribbed (see nos. 11 and 12)

Buds nodding; calyx-lobes remaining united and turned to one side under the open flower
- Sierra Nevada species; stigmas distinct.
  - Petals 2-lobed ..... 1. *G. biloba*
  - Petals not lobed.
    - Calyx-tube without annular process.
      - Capsule sessile or subsessile, not at all or scarcely beaked; style no longer than stamens ..... 2. *G. dudleyana*
      - Capsule long-pediceled and long-beaked; style much longer than stamens ..... 3. *G. arcuata*
    - Calyx-tube with an annular swelling at summit of ovary ..... 4. *G. hansenii*
- Coast Range species; stigmas partly united so as to form a saucer-shaped or shallowly cup-shaped base.
  - Ovary often curved before anthesis; inflorescence usually very loose; capsule typically with flat sides ..... 5. *G. bottae*
  - Ovary straight and deflexed before anthesis; flowers in a closer spike ..... 6. *G. deflexa*

Buds erect.
- Tube of calyx long (2½ to 5½ lines).
  - Calyx-lobes remaining united and turned to one side under the flower.
    - Flowers loosely spicate-paniculate; capsule shortly attenuate at apex ..... 7. *G. amoena*

Flowers spicate on short slender branchlets of the single main stem; capsule thick, blunt at apex.....8. *G. blasdalei.*
Calyx-lobes commonly distinct and closely reflexed.
Erect; capsules straight or nearly so; Sierra Nevada.....9. *G. viminea.*
Diffuse; capsules curving; Coast Ranges.....10. *G. parviflora.*
Tube of calyx short (1 to 1½ lines long).
Calyx-lobes commonly distinct and closely reflexed.
Capsule long and slender, not strongly ribbed; spikes usually long and flowers scattered.....11. *G. quadrivulnera.*
Capsule short and thick, strongly ribbed; spikes short or at least not loose..
12. *G. goddardii.*
Calyx-lobes united and turned to one side under the open flower; capsule pedicellate.....13. *G. epilobioides.*

B. Flowers in dense clusters; capsule 8-ribbed (the ribs on the lateral faces sometimes indistinct), more or less 4-sided.

Petals 5 to 11 lines long; mostly interior.
Stems regularly leafy.
Ovary hairy; petals pale crimson with a dark blotch at apex, 5 to 11 lines long..
14. *G. purpurea.*
Ovary glabrous; petals rose-red, without blotch, 6½ lines long...15. *G. arnottii.*
Stem interruptedly leafy; petals purplish with a spot toward summit, 5 lines long...
16. *G. sparsifolia.*
Petals large, 1½ to 1¾ in. long; north coast.....17. *G. grandiflora.*

1. **G. biloba** (Dur.) Wats. Stem simple or branching, 1 to 2 ft. high; leaves oblong-lanceolate or linear, ½ to 2 in. long, entire or remotely denticulate, the lower on long slender petioles; buds nodding, narrowly ovate, commonly abruptly tipped with a slender point; calyx-lobes united and turned to one side in anthesis, purplish brown, the tips not free in the bud; calyx-tube with a dense ring of short white hairs at the mouth; petals broadly cuneate, emarginate or with a deep v-shaped notch at apex, 5 to 11 lines long; capsule 4-sided, weakly 8-ribbed, 5 to 7 (11) lines long, on pedicels ½ to 1 line long.—Hillslopes, 25 to 2300 ft.: Sierra Nevada foothills from Butte Co. to Mariposa Co.; Contra Costa Co. from Mt. Diablo to Crockett. June-July.

2. **G. dudleyàna** Abrams. Stem slender, simple or with rather strict branches above the middle, less commonly from the base, ¾ to 2¾ ft. high; herbage puberulent or the older parts glabrous; leaves filiform to oblong, entire or remotely denticulate, ½ to 2½ in. long, petioled or sessile; conduplicate upper leaves few or none; buds slender, ovate, often abruptly attenuate near apex, nodding, the tips of the calyx-lobes not free; calyx purple to lavender, its lobes turned to one side in anthesis; petals pink-crimson with crimson dots in center, 6 to 13 lines long; stamens as long as the style; filaments all or only those of the short stamens purple; anthers yellow; style purplish; capsule slender, sessile or nearly so, 2-ribbed on each face, 6 to 10½ lines long.—Barren hills or open chaparral, 1800 to 6000 ft.: Sierra Nevada foothills from Tuolumne Co. to Tulare Co.; s. to the San Gabriel Mts. and San Bernardino Mts. June-July. Var. BRANDÈGEAE Jepson n. comb. Petals broad (mostly 5 to 10 lines), shallowly notched.—Sweetwater Creek, Eldorado Co. (f. brandegeae Jepson.)

3. **G. arcuàta** (Kell.) Jepson. KELLOGG GODETIA. Stem slender, sparingly branched, more or less falsely dichotomous on account of the repeated divergence of axis and branch, 7 to 20 in. high; leaves linear, entire, obtusish, 1¼ to 2 in. long, the fascicled and upper leaves narrow (½ to 1 line broad), commonly conduplicate and appearing much narrower, more or less arcuate-curving, with long slender acute tips, 2 to 2½ in. long; flower buds large, ovate, acute; calyx-tube 2 to 3 lines long, often purple inside, the lobes remaining united and turned to one side; petals fanshaped, lilac, 10 to 15 lines long, usually retuse at the more or less truncate apex; style much longer, often twice longer than stamens; anthers yellow; ovary hispidulose with short spreading hairs; capsule 8-ribbed, the ribs separated by broad sharply defined channels, those opposite the partitions broader, about 12 lines long, with a beak 2½ to 3 lines long, the pedicels 2½ to 5 lines long; seeds sharply pointed at one end, the other end obliquely flattened and with a thin margin.—Foothills, 1000 to 2000 ft., Eldorado Co. to Mariposa Co.

4. **G. hansènii** Jepson. Stem very slender, sparingly branched, 4 to 10 in. high; herbage puberulent or the stem glabrous; leaves narrowly linear (½ to 1 line broad), acute or long acuminate, entire and sparsely or obscurely denticulate, 1 to 1⅝ in. long, subsessile or shortly petioled; buds at an early stage nodding but soon erect, the calyx-tips not free; flowers few, scattered in the upper axils; sepals in anthesis remaining united and turned to one side; calyx-tube narrowly vase-shaped, 3 to 3½ lines long, with a distinct annular swelling at summit of the ovary; ovary apparently glabrous, but sparingly covered with minute short spreading gland-tipped hairs, inversely clavate; stamens about half the length of the petals; style nearly as long as petals; stigmas whitish; capsules about 10 lines long including the marked beak (1 to 3 lines long); lateral faces of capsule with a very shallow furrow sloping to center, the other faces with 2 or 3 filiform ridges; pedicels 1 to 3½ lines long.—Amador Co., 5000 ft.

5. **G. bóttae** Spach. Stem slender, erect, simple or more commonly branching at or from the base, 1 to 3¼ ft. high; leaves linear or lanceolate, or the lower oblong, remotely denticulate, ¾ to 2½ in. long, petioled or sessile; flowers axillary but falsely terminal through usurpation, the growing capsules thrusting the shoot to one side so that the latter seems proliferous; buds nodding, slender ovate, abruptly tipped with a slender short point; calyx-tube very short, 1 to 1½ lines long; calyx-limb turned to one side with the lobes united in anthesis, commonly crimson-tinted; petals pink or light crimson, 8 to 13 lines long; stamens equaling the style; stigma deeply parted into 4 oblong or elliptic lobes but united at base so as to form a swollen somewhat cup-shaped apex to the style; capsules scattered, rather distinctly 4-sided with the plane sides not at all ribbed or obscurely so, ¾ line broad, 11 to 16 lines long, on pedicels ½ to 1½ in. long; seeds all over minutely granulate.—Hill and chaparral slopes, 50 to 1500 ft.: San Gabriel Mts.; Santa Monica Mts.; n. to Monterey Co. May-June. Var. USITÀTA Jepson. Stigma short-oblong or quadrate; capsule commonly sessile or nearly so, thick, rather obviously 8-ribbed.—Valleys, coastal S. Cal. Var. CYLÍNDRICA Jepson. Nearly or quite simple, 7 to 15 in. high, few-flowered; leaves narrowly linear or subfiliform, ¼ to ½ line broad; calyx indigo-purple, its tube with a ring of white hairs at mouth; petals 9 to 11 lines long, lilac-purple, or paler with a sprinkling of dark dots, at base with a dark purple band; anthers sometimes purple-dotted; capsules slender (scarcely more than ¼ line broad), teretish, not costate, as much as 1½ in. long, sessile (or sometimes with a pedicel 3½ lines long). — Mountain slopes, 1000 to 4000 ft., surrounding the upper San Joaquin Valley from Squaw Valley, Fresno Co., to Ft. Tejon, thence n. to Alcalde and w. to San Luis Obispo Co.

662. Godetia amoena Lilja; *a*, fl. branchlet x ½; *b*, anther x 1¼; *c*, style and stigmas x 1¼; *d*, cross sect. of ovary x 5.

6. **G. defléxa** Jepson. Similar to no. 5; stem stout; calyx-buds large (7 lines long), borne on abruptly deflexed sessile ovaries; stigma peltate or somewhat saucer-shaped, undulately 4-lobed. — Sandy plains, Los Angeles.

7. **G. amoèna** (Lehm.) Lilja. SUMMER'S DARLING. Fig. 662. Stem erect, simple or more commonly branching, 1 to 3 ft. high; leaves linear to lanceolate, narrowed at base to a petiole or sessile, ½ to 2 in. long (or with smaller ones fascicled in the axils), the uppermost half-conduplicate and curved; buds erect,

rarely drooping; calyx-lobes united and turned to one side in anthesis but usually distinct at base, less commonly wholly distinct, 6 to 11 lines long, their tips not free in the bud; petals lilac-crimson or red-pink, often with a darker central splotch and base, abruptly narrowed to a short claw, 7 to 11 lines long; stigmas yellow, linear, 1½ to 3 lines long; ovary canescent; capsule teretish, not ribbed, tapering very slightly to each end, 1 to 1⅜ in. long, sessile or on pedicels to 3 lines long.—Dry hills, bushy or wooded slopes, 100 to 1500 ft.: near the coast from Monterey Co. to Del Norte Co.; n. to B. C. July-Aug. It is prized in cultivation and is also called Farewell to Spring, but both the common names are invented by some poet or other as Herodotus would say. The species is plastic. Var. CÓNCOLOR Jepson. Simple, 8 to 12 in. high; leaves narrowly linear; sepals united and turned to one side; petals 5 to 7½ lines long, uniform crimson.—Napa Range. Var. PYGMAÈA Jepson. Very slender, unbranched, 4 to 11 in. high, all the parts small; petals crenulate, often abruptly acute, 2½ to 5 lines long, usually with central blotch.—Conn Valley, Napa Range. Var. ALBICÁULIS Jepson. Stems white shining, simple or strictly branched, 20 in. high; leaves narrow; petals 1¼ to 1¾ in. long; capsules about 1¾ in. long, with a beak usually 5 lines long.—Butte Co. plains. Var. HUNTIÀNA Jepson n. comb. Diffuse, widely branching, 1 to 2½ ft. high; flowers small; petals crimson with a mostly 3-forked blotch in the center, 5 to 7 lines long.—Blue Lakes. (f. huntiana Jepson.) Var. LÍNDLEYI Jepson. Spotted Blush. Petals 10 to 17½ lines long, almost uniformly with a large central blotch.—Along or toward the coast, Humboldt Co.; n. to B. C.

8. **G. blasdàlei** Jepson. Stem erect, often stout, simple or with slender short strict branches, 2 to 3 ft. high, soon leafless except above; leaves oblong to linear-lanceolate, acute, 1⅛ to 1¾ in. long; herbage puberulent; flowers essentially like those of the large-flowered form of G. amoena, but petals notched at apex or even deeply bilobed; ovary thick below middle, tapering to base, and also to apex something like a rifle cartridge; capsule canescent, thick, terete, rather short (6 to 8 lines long), on pedicels ¾ to 2 in. long.—E. shore of San Francisco Bay.

9. **G. vimínea** Spach. Stems whitish and shining or sometimes reddish above, strictly erect and simple or with simple suberect branches, 1 to 3 ft. high; herbage finely pubescent, the older parts of the stem glabrescent; leaves linear to lanceolate, entire, narrowed at base to a short petiole or the upper sessile and commonly conduplicate, ½ to 2 in. long; buds erect; calyx-tube broadly vase-shaped or narrowly campanulate, whitish membranous, 3 to 5½ lines long; calyx-lobes lanceolate, acuminate, distinct, primly reflexed, their tips free in the bud; petals purplish or crimson, with a large purple splotch in center or at apex, and often yellow at base, 6 to 12 lines long; stamens about ½ the length of the petals or less; anthers white, longer than the filaments; style as long as or longer than the stamens; stigmas purple, hispidulose; capsule 4-sided with 2 ribs on each side, or those of the lateral faces obscure or wanting, puberulent, sessile or rarely with a pedicel ½ line long; seed very short, weakly margined.—Dry hill-slopes, 1300 to 5000 ft.: Sierra Nevada foothills from Kern Co. to Calaveras Co.; n. to Ore. May-July. Var. CONGDÒNII Jepson. One to 1½ ft. high; buds loosely pilose; calyx-tips slender and very distinct; petals yellow at base.—Hetch-Hetchy. Var. INCÉRTA Jepson. Very leafy, 7 to 15 in. high; petals deep crimson, 6 to 10 lines long; capsules abundant, 8-ribbed; stigmas oval.—Yosemite Valley. Var. MARGARÌTAE Jepson. Buds and flowers few and widely scattered on the very slender stems; calyx-tube very slender, 4½ to 7 lines long, the segments more or less cohering in anthesis.—Margarita Valley, San Luis Obispo Co.

10. **G. parviflòra** Jepson. Stems usually diffusely branching from the base, ½ to 2¼ ft. long, the branches numerous and wiry; leaves narrowly lanceolate or linear, 5 to 12 lines long, the lowest oblong or oblong-ovate; calyx in bud 4-sided and its tips free, the segments in anthesis commonly distinct; calyx-tube pinkish, long and slender (2½ to 5 lines long), usually longer than the ovary and commonly swollen slightly at the summit of ovary; petals cuneate-obovate, rose-red, 4 to 7½ lines long, the stamens ⅔ their length;

style nearly or quite equaling the petals; stigmas purple, elliptic, somewhat united at base; capsules teretish, rather strongly curved, obscurely 2-ribbed on the sides, 4½ to 9 lines long.—Monterey Co. June.

11. **G. quadrivúlnera** (Dougl.) Spach. Stem erect, simple or with simple branches from below the middle, ⅔ to 1⅔ ft. high; herbage pubescent or puberulent; lowest leaves obovate or oblong, 5 to 11 lines long, the upper narrowly or broadly linear, the uppermost lanceolate and somewhat conduplicate, ⅝ to 1⅜ in. long; flowers discrete or remote; calyx-lobes usually distinct and reflexed (in the earliest flowers sometimes united and turned to one side); petals lilac or pale crimson, usually with a spot at the top, 2½ to 5 lines long; ovary canescent to densely villous; stigmas purple, short-oblong; capsule sharply 4-sided, the sides smooth or obscurely ribbed, often rather strongly beaked, ½ to 1 in. long, sessile.—Open hillsides, 300 to 4400 ft., throughout cismontane Cal.; n. to Ore. and Wash. The most common species; it is very variable in habit, pubescence, color of flowers, and ribbing and length of capsules. May-June. The following varieties, which in some cases intergrade freely, give an idea of the range of variation. Var. APICULÀTA Jepson. Pale, slender; buds strongly apiculate.—Howell Mt. Var. VACÉNSIS Jepson. Stems slender, often branched at the base; flowers very remote; capsules slender, 1¼ in. long.—Vaca Mts. Var. DÀVYI Jepson. Leaves all or mainly oblong and mostly obtuse, about 6 lines long; midrib of valves prominent, ribs none or 4.—Point Reyes. Var. FLAGELLÀTA Jepson n. comb. Simple or with few elongated very slender whip-like branches, 1¼ to 2 ft. high; flowers very remote.—Vaca Mts. (f. flagellata Jepson.) Var. HÁLLII Jepson. Freely branching, 2 ft. high; petals ovate, with an abrupt short small point, light pink with a sharply defined deep purple or reddish wedge-shaped spot at apex; stigmas very short, subquadrate; ovary and capsule hairy; ribs filiform.—Box Springs Mt., Riverside. Var. SETCHÉLLIÀNA Jepson n. comb. Branching from base; young parts very canescent; style longer than stamens; capsule short, densely short villous.—Santa Cruz Mts. (f. setchelliana Jepson.) Var. RUBRÍSSIMA Jepson. Petals roundish ovate, 4½ to 6½ lines long, uniformly deep reddish purple; ovaries canescent; capsules strigulose-pubescent.—Box Springs Mt., Riverside.

12. **G. goddárdii** Jepson. Stem simple or sparingly branched, 1 to 2⅓ ft. high, foliage and buds as in no. 11 but spikes not so lax; petals pink-crimson or purple-crimson, with or without dark crimson spot at apex, 2½ to 6 lines long; calyx-lobes primly reflexed, in pairs or quite distinct; capsule sessile, almost glabrous or canescently puberulent, terete, 8-ribbed, and with 8 distinct but small nerves which are median and at the sutural angles, 4 to 7 lines long.—Dry open hills, Contra Costa Co. to Humboldt Co. June. Var. MIGUELÍTA Jepson. Stem branching mainly above (sometimes simple); petals deep crimson; capsules pilose or pubescent, short (5 to 8 lines long) and thick (1½ lines broad), strongly 2-ribbed on each side and strongly nerved at the angles, very shortly pedicelled.—San Antonio River Valley, Monterey Co. Var. CAPITÀTA Jepson n. comb. Stem about 20 in. high, with simple secondary branches from the base, 2¼ to 6 in. long; herbage puberulent; flowers in head-like bracteate clusters at end of branches; ovaries densely pilose.—Centreville, Fresno Co. (f. capitata Jepson.)

13. **G. epilòbioìdes** Wats. Stem slender, simple or nearly so, erect, 6 to 19 in. high; herbage minutely puberulent; leaves oblong to linear, remotely and minutely toothed, 5 to 11 lines long; petioles 1 to 3 lines long, the uppermost leaves nearly sessile; buds nodding, the tip of the calyx-lobes not free; calyx-tube ¼ line long; calyx-lobes united and turned to one side in anthesis; petals obovate, commonly cream-yellow, rarely lavender-pink and dotted on the lower half, 3 to 4½ lines long; stamens about half the length of the petals; anthers nearly twice the length of the filaments; stigmas very slightly lobed, as if capitate; capsules 4-sided, with plane or flattish faces, or with the reddish or brown midnerve somewhat depressed, 10 to 12½ lines long, pedicels 1 to 2½ lines long, sometimes very short but always present.—Hills and valleys, 300 to 2000 ft.: coastal S. Cal.; n. to San Luis Obispo Co. May.

14. **G. purpùrea** (Curtis) Don. Stems prevailingly simple and usually stoutish, ⅛ to 2 ft. high, the flowers capitately congested at the summit or disposed in the upper axils of the leafy stem, the single flowers sometimes replaced by a cluster of 2 to 4 and borne on very short branchlets; herbage minutely pubescent; leaves ovatish-oblong or oblong, obtusish or merely acute, the upper oblong-lanceolate or lanceolate, entire or remotely denticulate, sessile or very shortly petioled, ½ to 1⅜ in. long; buds commonly pilose, their calyx-tips but slightly free; calyx-tube 2½ to 3½ lines long; petals broadly cuneate, truncatish and eroded at apex, 5 to 10 lines long, light crimson, usually with a wedge-shaped darker spot in middle at apex; stigmas oval, purple; ovary shaggy villous or canescent; capsule 4-sided, sessile, stoutish and mostly short, 5 to 7 (or 11) lines long, shaggy or merely pubescent, 8-ribbed; seeds faintly granulate on sides.—Dry open valleys: Sacramento and San Joaquin valleys; South Coast Ranges; coastal S. Cal. May. Var. ÉLMERI Jepson. Flowers loosely spicate below the dense terminal cluster of young buds; petals broadly ovate, dark red in dried specimens, 7 lines long; capsule stout and rather short.—Santa Barbara. Var. PROCÈRA Jepson. Slender, tall (1¾ to 2½ ft. high), simple or with few short slender branchlets; flowers small, the petals 2½ to 3 lines long.—Berkeley. Var. LACUNÀRUM Jepson. Tall (1¼ to 1¾ ft. high), freely branching, upper portions of the branches angled or compressed; flowers congested at the ends of the branches; petals 4 to 6½ lines long.—Oakdale, San Joaquin Valley.

15. **G. arnóttii** (T. & G.) Walp. Simple, 6 to 14 in. high, wholly glabrous; leaves thickish, rhomboidal-ovate to oblong or oblong-lanceolate, entire or sparingly denticulate, ⅝ to 1½ in. long, subsessile; buds glabrous, their calyx-tips free; flowers congested in a terminal head; calyx-tube 1½ lines long; petals rose-red, with whitish base, orbicular, entire, 6 lines long; stigma whitish or pale crimson; ovary deeply grooved, quite glabrous; capsule teretish, 8-ribbed, 6 lines long.—Sandy-clay plains, Sacramento Valley.

16. **G. sparsifòlia** Jepson. Stem simple or branching at the base, 11 in. high; flowers collected in a dense and leafy terminal cluster, the stem sparsely leafy below; leaves linear-oblong, acute, ¾ to 1⅛ in. long, sessile; herbage pubescent or pilose, the deeply grooved ovary densely hairy; sepals distinct, calyx-tube narrow, 1½ lines long; petals oblong-ovate, purplish with a spot towards summit, 5 lines long; stigma almost entire, purple; style as long as the long stamens, about half the length of the petals.—Lower San Joaquin Valley.

17. **G. grandiflòra** Lindl. Dwarfish, the stem stout, simple, or with short slender branches above the base, 8 to 12 in. high, very leafy; herbage minutely strigulose; leaves oblong, tapering strongly to apex and to the short petiole at base, ¾ to 1½ in. long; buds very large, 1¼ to 1¾ in. long, the calyx-tips not free; flowers in a short spike or dense cluster of short subterminal branchlets; petals cuneate-obovate, retuse at apex, 1½ to 1¾ in. long, rose-red with a deeper flush or blotch in center; stigmas yellow, linear, 3 lines long; capsule canescent, thick and short, ¾ in. long, strictly sessile; seeds in 2 rows in each cell.—Hills near the ocean, Sonoma and Mendocino Cos.

8. OENOTHÈRA L.

Herbs with alternate or basal leaves. Flowers yellow or white, often turning greenish or reddish. Calyx-tube prolonged beyond the ovary, mostly deciduous, the lobes 4, reflexed. Petals 4. Stamens 8, equal, or those opposite the petals shorter, mostly versatile, sometimes basifixed. Capsule chartaceous to woody, straight, contorted or spirally coiled, 4-celled, 4-valved, dehiscent. Seeds many, naked. (Greek oinos, wine, and thera, pursuit, name given by Dioscorides to some now unknown plant, the roots of which were eaten to incite desire for wine.)

A. STIGMA DIVIDED INTO 4 LINEAR LOBES; CAPSULE SESSILE OR NEARLY SO.

1. Plants with stems bearing leaves and flowers; calyx-tube ¾ to 1½ in. long.

Flowers yellow, the buds erect; stems tall, 1½ to 5 ft. high; seeds in 2 rows in each cell; biennial.—Subgenus ONAGRA.....1. *O. hookeri.*

Flowers white, the buds nodding; stems low; capsules linear, smooth; seeds in 1 row in each cell.—Subgenus ANOGRA.
Tips of calyx-lobes not free in the bud; pubescence usually spreading; stems sparsely leafy; annual.... ....2. *O. trichocalyx.*
Tips of calyx-lobes free in the bud; stem very leafy; pubescence appressed; perennial. 3. *O. pallida.*

2. Plants with the leaves and flowers borne at the ground in a basal tuft or rosette on the root-crown; flower-buds erect; perennials.

Flowers yellow.—Subgenus LAVAUXIA.
Tips of calyx-lobes not free; calyx-tube 1 to 2 in. long; seeds not angled, in 1 row in each cell; herbage pubescent.
Leaves deeply and regularly pinnate, the lateral lobes numerous and well-developed, or sometimes sublyrate; angles of capsule with a small rounded or acutish ridge but not winged; seeds coarsely and irregularly tuberculate....4. *O. primiveris.*
Leaves lyrately pinnatifid with few and small lateral lobes, sometimes entire; angles of capsule with thick wings below; seeds minutely tuberculate.. 5. *O. xylocarpa.*
Tips of calyx-lobes free in the bud; calyx-tube 2 to 4 in. long; seeds evidently angled, in 2 rows in each cell; herbage glabrous or glabrate....6. *O. triloba.*
Flowers white; capsule oblong, the angles with a coarsely-toothed narrow wing or with tubercles; seeds in 2 rows in each cell; leaves and flowers borne in a tuft on the root-crown.—Subgenus PACHYLOPHUS....7. *O. caespitosa.*

B. STIGMA CAPITATE OR DISCOID.

1. Calyx-tube slender or filiform, ½ to 4 in. long, 3 to 5 times the length of the ovary; capsule sessile or nearly so; seeds in 2 rows in each cell.—Subgenus TARAXIA.

Perennials; leaves and flowers borne in a rosette or tuft on the ground; leaves evidently narrowed to a petiole; capsule not winged.
Leaves deeply pinnatifid; capsule densely pubescent....8. *O. tanacetifolia.*
Leaves entire or with 1 or 2 small lobes or teeth; capsule glabrous.
Capsule linear, 2 lines wide, at maturity shrunken about the seeds; seeds with a scurfy bran-like surface; petioles pubescent; coastal....9. *O. ovata.*
Capsule oblong to ovate, 3 to 4 lines wide, not at all shrunken about the seeds; seeds smooth, favose-pitted; petioles glabrous; high montane.... 10. *O. subacaulis.*
Annuals; leaves and flowers borne in a tuft on the root-crown or short stem or on its very short (¼ to 2 in. long) branches; leaves linear (1 to 3 lines wide), not narrowed to a petiole; capsule short, obovoid-quadratish, with 4 thick obliquely truncate wings.
Petals 4 to 5 lines long; leaves 1 to 4 in. long; stems very short, commonly unbranched, but if branched, the branches slender; cismontane.... 11. *O. graciliflora.*
Petals 1 to 2 lines long; leaves 1 to 1½ in. long; stems commonly with several very stout horizontal branches; deserts....12. *O. palmeri.*

2. Calyx-tube obconic or narrow-funnelform, ½ to 2 lines long, less than half the length of the ovary; annuals except no. 14.

Capsule sessile or nearly so; seeds in 1 row in each cell.—Subgenus SPHAEROSTIGMA.
Flowers yellow, solitary in the axils of the leafy stems.
Capsules evidently quadrangular; low, more or less spreading plants; leaves entire or sinuate-toothed; capsule contorted, the base of it ascending.
Petals 2 lines long....13. *O. micrantha.*
Petals 3 to 10½ lines long.
Leaves white-pubescent; perennial....14. *O. spiralis.*
Leaves green or greenish; annual....15. *O. bistorta.*
Capsules terete, or at least not evidently quadrangular; stem leafy to the top, the leaves of the inflorescence scarcely shorter than those below.
Petals 3 to 8 lines long....16. *O. dentata.*
Petals 1 to 2 lines long.
Capsules linear, more or less curved, 8 to 18 lines long; petals 1½ to 2 lines long....17. *O. contorta.*
Capsules lanceolate, straight, 3 to 6 lines long; petals about 1 line long. 18. *O. andina.*
Flowers white (rarely yellow), borne in terminal spikes, the spikes commonly nodding in the bud; stems with the leaves strongly reduced above or inconspicuous.
Flowers minute (petals about 1 line long); spikes very loose; capsules terete, straight, ascending....19. *O. chamaenerioides.*
Flowers conspicuous (petals 2 to 3 lines long).
Capsules terete, commonly refracted (at least some of the lowest); spikes rather loosely flowered....20. *O. refracta.*
Capsules quadrangular, or subterete, all ascending (or at least the base of them); spikes densely flowered....21. *O. alyssoides.*
Capsule long-pediceled; seeds in 1 row in each cell; flowers in dense terminal spikes, the spikes nodding at tip; desert species.—Subgenus CHYLISMIA.
Leaves orbicular-cordate, scattered; under side of leaves green-veined.... 22. *O. cardiophylla.*
Leaves oblong to ovate and more or less pinnatifid, usually more or less basally clustered or on lower part of stem; under side of leaves purple-veined.

Capsules 4 to 5 lines long, on pedicels over half as long; petals shortly clawed.. 23. *O. scapoidea.*
Capsules 1 to 2¾ in. long, on pedicels about ½2 as long; petals not clawed..... 24. *O. brevipes.*

1. **O. hoókeri** T. & G. Evening Primrose. Fig. 663. Stem erect, usually simple, 2 to 4 ft. high; herbage canescently puberulent and often hirsute; leaves ovate to lanceolate, or oblanceolate, 4 to 9 in. long, the lowest drawn down to petioles ⅕ to ½ as long; calyx-tube 1 to 1½ in. long, the tips free in the bud; petals yellow, 1 to 2 in. long and quite as broad; anthers versatile, ½ in. long; style disk-shaped below the cylindric stigmas; capsule obtusely quadrangular, woody, ½ to 2 in. long, the valves with a strong midrib; seed sharply angled. — Moist lowlands or along streams, 10 to 5000 ft., cismontane Cal. (O. grandiflora Fl. W. Mid. Cal.)

663. Oenothera hookeri T. & G.; *a*, leaf; *b*, fl. stem; *c*, capsule. x ½.

2. **O. trichócalyx** Nutt. Stem simple, short, very thick or even conical, 1 to 2 (or 6) in. high, very densely flowered, commonly developing from beneath this short dense spike several ascending stems 4 to 14 in. (or even 2½ ft.) high which are loosely flowered above, and sparsely pilose or almost glabrous; leaves oblong to ovate or lanceolate, tapering to both ends, subentire or rather remotely denticulate to coarsely and saliently toothed or lobed, pubescent or pilose, 1 to 7 in. long, margin at first undulate, shortly petioled; calyx-tube ¾ to 1¼ in. long; calyx-tips not free in the bud; bud (just before anthesis) oblong, woolly-pilose; petals ¾ to 1¼ in. long, usually with a deep sinus; capsules very slender, terete, thickened towards the broad sessile base, slightly curved or nearly straight, widely spreading or in maturity strongly deflexed, woody, 1⅛ to 3 (4) in. long; seeds narrowly ovate, mottled, somewhat compressed.—Sandy plains and flats, 100 to 4000 ft.: Colorado and Mohave deserts; n. along e. side Sierra Nevada to Lassen and Siskiyou Cos.; San Joaquin Valley and bordering foothills; e. to Wyo. and N. Mex. In age the ascending curving stems tend to approximate at tip, the plant becomes loosened from the soil and so forms a roundish "basket" which rolls along under the wind and so scatters the seed. (Anogra trichocalyx Small.) Var. cognàta Jepson n. var. Leaves green and glabrate.—Inner South Ranges (Corral Hollow, Brewer 1217, type); upper San Joaquin Valley. Var. cineràcea Jepson n. var. Leaves finely strigulose; buds white with short appressed hairs.—Borrego Spr., w. Colorado Desert (T. Brandegee, type).

3. **O. pállida** Lindl. Stems slender, 5 to 14 in. high, ascending from a perennial running rootstock; leaves narrowly to broadly lanceolate or oblanceolate, entire, remotely denticulate, or pinnately lobed or toothed, bright green, glabrous or subglabrous, 1 to 2 (or 4) in. long, sessile or shortly petioled; flowers several, axillary, vespertine; calyx-tips free in the bud; buds narrowly ovate, or oblong, glabrous; calyx-tube ¾ to 1½ in. long; petals white, turning pink, broader than long, 1 to 1½ in. long; capsule narrow-linear, 8-ribbed, obtusely quadrangular, sessile, 1 to 2¼ in. long, not thickened at base; seeds oblong, turgid, smooth, one row in each cell.—Sandy plains and flats, 1000 to 5000 ft.: Santa Monica Mts. to the San Bernardino Mts.; Mohave Desert; e. to Rocky Mts. (Anogra pallida Britt.) Var. californica Jepson n. comb. Stems 6 to 22 in. high; herbage ashy with a dense

short strigose pubescence; flowers vespertine, remaining open 2 or 3 hours in the morning.—Sandy soil, valleys, desert washes and mountain flats, 200 to 7000 ft.: coastal S. Cal.; Mohave Desert; n. to Inyo Co. and the Sacramento Valley. (O. californica Wats.)

4. **O. primivèris** Gray. Leaves in a basal tuft, these and the flowers borne on the very short thick-conical axis of the root-crown; herbage more or less pilose, sometimes densely so; leaves lanceolate or oblong in outline, unequally and usually deeply pinnatifid, less commonly subentire or denticulate, 1 to 6 in. long, on petioles ¼ to 2 times as long; flowers vespertine; calyx-tube 1½ to 2 in. long; petals yellow, aging pinkish, 1 to 1⅛ in. long; capsules oblong-ovate or oblong-lanceolate, strongly 4-sided or quadrangular, straight or only very slightly curved, with a round or acutish ridge on the angles, 1 to 1¾ in. long; seeds irregularly tuberculate.—Sandy soil, 2000 to 3000 ft.: central and e. Mohave Desert; e. to southern Nev. and western Tex.; n. L. Cal. (Lavauxia primiveris Small.)

5. **O. xylocárpa** Cov. Leaves and flowers borne in a tuft on the crown of the very stout root; leaves lyrately pinnatifid (with the terminal lobe ovate to elliptic and the laterals few and small) or entire, 1 to 3 in. long, puberulent, on petioles as long or nearly so; calyx-tube 1 to 2 in. long; petals yellow, aging orange-red, 1 to 1½ in. long; capsules thick-lanceolate, attenuate, curved or contorted, 2½ to 3 in. long, the angles developed into thick somewhat undulate wings, the back of each valve prominently ribbed; seeds minutely tuberculate.—Sandy flats, high plateau country, upper Kern River, 8000 to 9800 ft. (Anogra xylocarpa Small.)

6. **O. tríloba** Nutt. Leaves and flowers borne in a tuft on the root-crown; herbage glabrous or subglabrous; leaves lanceolate in outline, deeply and irregularly pinnatifid below the entire apical portion, 3 to 4 in. long, on petioles ¼ as long; flowers diurnal; calyx-tube 2 to 4 in. long; petals yellow, aging pinkish, 10 to 12 lines long; capsule ovate to broadly oblong, angles winged, sides prominently ribbed and reticulate-veined, 7 to 10 lines long; seeds angled, minutely and densely tuberculate.—Plateau country: Shasta and Modoc Cos.; n. to Can., e. to Col., thence s. to Mex. (Lavauxia triloba Spach.)

664. Oenothera ovata Nutt.; *a*, habit x ⅙; *b*, fl. x ⅜; *c*, long. sect. of ovary x 1½.

7. **O. caespitòsa** Nutt. Leaves in a basal rosette, these and the flowers borne in a tuft on the short axis of the root-crown; herbage green, pilose-pubescent or glabrate; leaves ovate to lanceolate in outline, coarsely and irregularly or often sparsely dentate, sometimes subentire, 1 to 4 in. long, narrowed to a petiole half to as long; tips of calyx-lobes not free in the bud; calyx-tube 3 to 5½ in. long, dilated upward into a narrow-funnelform dilation; petals white, turning pink, 1 to 1¾ in. long; capsule oblong or linear to narrow-ovate, obtusely quadrangular, 1 to 1¾ in. long, the angles with 2 narrow coarsely toothed wings, or the angles merely warty; seeds minutely and densely tubercled.—Desert slopes, plains and washes, 2000 to 7400 ft.: e. Mohave Desert, n. through Inyo Co. and along e. side Sierra Nevada to eastern Nevada Co., Cal., and to Washoe Co., Nev.; n. to eastern Ore., e. to Col. (Pachylophus caespitosa Raim.)

8. **O. tanacètifòlia** T. & G. Leaves in a basal rosette, these and the flowers crowded on the root-crown; herbage canescent to scantily puberulent; leaves narrow-oblanceolate, irregularly and unequally pinnatifid or pinnately divided, 1½ to 4 in. long, on petioles ¼ to ⅔ as long; calyx-tube 1 to 2 in. long; petals yellow, aging yellowish or pinkish, 5 to 7 lines long; capsules narrow-ovate to broadly lanceolate, quadrangular, 5 to 10 lines long; seeds minutely and regularly areolate.—Valleys and hillslopes, easterly summits or e. side of the Sierra Nevada, 4800 to 7000 ft., from Sierra Co. to Siskiyou and Modoc Cos.; w. Nev. to Ida. (O. nuttallii T. & G.)

9. **O. ovàta** Nutt. GOLDEN EGGS. Fig. 664. Leaves in a basal rosette, these and the flowers arising from the crown of the thick root; herbage glabrous or the leaf margins and veins beneath ciliate; leaves oblong to ovate, acute, entire or subentire, 3 to 6 in. long, the under ones of the rosette narrowed at base to rather long petioles; calyx-tube very slender, 3 to 4 in. long, the segments glabrous; petals orbicular, ½ in. long; capsules more or less below the surface of the ground, chartaceous, 1 in. long, tardily dehiscent.—Open hillslopes towards the coast, 200 to 1500 ft.: San Luis Obispo Co. to Mendocino Co.; also sw. Ore. Feb.-Apr. (Taraxia ovata Small.)

10. **O. subacáulis** Jepson n. comb. Leaves in a broad rosette, these and the flowers seated on the root-crown; herbage glabrous or nearly so; leaves lanceolate to narrow-ovate, entire or denticulate, or with 2 or 3 pairs of small supplementary lobes at base, 1¼ to 5 in. long, on petioles ⅓ to ⅔ as long; calyx-tube slender or filiform, 1 to 2½ in. long; petals yellow, aging pale yellow or white, 3½ to 7 lines long; capsule oblong to elliptic or ovate, quadrangular, smooth or more or less rugulose, ridged on the angles, 6 to 9 lines long; seeds yellowish, favose-pitted.—Moist meadows, 4000 to 8600 ft.: easterly summits or e. side Sierra Nevada from Tulare Co. to Nevada Co. and n. to Modoc Co. (Jussiaea subacaulis Pursh. O. heterantha Nutt.) Var. TARÁXACIFÒLIA Jepson n. comb. Leaves markedly lyrate-pinnatifid.—Sierra and Plumas Cos. (Oenothera heterantha var. taraxacifolia Wats.)

11. **O. grácilifl̀ora** H. & A. Fig. 665. Leaves and flowers in a tuft, crowded on the root-crown or short branches; herbage hirsute-pubescent; leaves erect or ascending, linear, entire or sometimes obscurely denticulate, 1 to 3½ in. long, sessile; calyx-tube beyond ovary filiform, ½ to 1 in. long, the segments hirsute-pubescent; petals broadly obovate, the broad shallow notch at apex with a middle tooth or acumination, 3 to 4 lines long; capsule quadratish in outline, with a short wing-like tooth on the angles near the summit, coriaceous, 3 to 6 lines long.—Hill country and rolling plains, 500 to 2000 ft.: Great Valley and surrounding foothills, w. to Mendocino, Monterey and San Luis Obispo Cos., n. to Siskiyou Co. (Taraxia graciliflora Raim.)

665. Oenothera graciliflora H. & A.; *a*, habit; *b*, capsule. x 1.

12. **O. pálmeri** Wats. Stem branched at the ground into several short very stout horizontal or contorted branches ¼ to 2 in. long, the bark white, exfoliating; leaves linear (or oblanceolate), entire or obscurely denticulate, exceeded in width by the broad sessile leaf base, minutely strigulose, 1 to 1½ in. long; calyx-tube filiform, 6 to 8 lines long; petals yellow, 1 to 2½

lines long; capsule ovate, 2½ to 4 lines long, coriaceous, quadrangular, the angles with a thick obliquely truncate wing; seeds minutely roughened.—Sandy soil, 2000 to 4000 ft.: Mohave Desert; Inyo Co.; n. through Nev. to eastern Ore., e. to Ariz. Stems and capsules very tough in age. (Taraxia palmeri Small.)

13. **O. micrántha** Hornem. Stems 1 to several from the base, procumbent or diffuse, 8 to 24 in. long; pubescence thinly hirsutulous; leaves ovate- to narrow-lanceolate, slightly undulate, more or less denticulate, 1 to 3½ in. long, the upper mostly sessile, the lower narrowed to a petiole; calyx-tube ¾ to 1 line long; petals entire or emarginate, 1 to 2 lines long; capsule sharply 4-angled, contorted, often coiled into a single spiral, slightly attenuate upwards, sparsely hirsutulous, ½ to 1 in. long.—Sandhills and sandy fields along the coast, San Francisco to coastal S. Cal. May-June. (Sphaerostigma micranthum Walp.) Var. IGNÒTA Jepson n. var. Stem usually simple, erect; herbage subglabrous; leaves usually sparser; capsule purplish.—Interior valleys of S. Cal. (Jurupa Hills, Wilder 90, type); s. Sierra Nevada. Var. RÈEDII Jepson n. comb. Petals with a more or less salient tooth in the apical notch.—S. Cal. foothills and valleys, rare. (Sphaerostigma bistortum var. reedii Parish. S. hirtellum montanum Dav.) Var. ABRÁMSII Jepson n. name. Leaves grey with a close short pubescence.—W. side Colorado Desert. (Sphaerostigma pallidum Abrams.) Var. HIRTÉLLA Jepson n. comb. Stems flowering from the base or near it, thinly hispid-hirsute; leaves oblong-ovate, often subcordate at the sessile base, crenately toothed, crisped, 6 to 12 lines long, the basal oblong or oblong-spatulate, narrowed to a petiole, 1 to 2½ in. long.—Mountain slopes and ridges, at middle altitudes: Mendocino and Lake Cos. to S. Cal.; Sierra Nevada from Amador Co. to Tulare Co. (O. hirtella Greene.)

14. **O. spirális** Hook. Fig. 666. Stems decumbent or mostly prostrate, radiating from a central rosette crowning the taproot, 1½ to 2½ ft. long,

666. Oenothera spiralis Hook.; *a*, habit x ½; *b*, long. sect. of fl. x ¾; *c*, capsule x ¾.

rigid and tough; leaves thick, white-pubescent, obovate to oblong or oblong-oblanceolate, obtuse, ½ to 1 in. long, sessile or the lower petioled; calyx-tube 1 to 2 lines long; petals yellow, 3 to 7 lines long; capsule linear-oblong, stout, chartaceous, acutely quadrangular or almost fluted, 7 to 10 lines long, spirally once coiled, the attenuate apex mostly spreading.—Sandhills and sandy beaches along the coast: Humboldt Co. to San Diego; n. L. Cal. (O. cheiranthifolia Jepson, Fl. W. Mid. Cal.) Var. VIRIDÉSCENS Jepson n. comb. Leaves green, round-ovate, cordate at the sessile base, denticulate, hirsute.—S. Cal. coast. (O. viridescens Hook.) Var. NÍTIDA Jepson n. comb. Wholly glabrous.—San Miguel Isl.; Monterey. (O. nitida Greene.) Var. LINEÀRIS Jepson n. var. Leaves linear, weakly strigose.—W. San Diego Co. (Sunnyside, Hall 3908, type).

15. **O. bistórta** Nutt. Stems several from the base, ascending or prostrate, 2 or 3 in. to 2 ft. long; herbage thinly pilose or puberulent; leaves linear-oblanceolate or the upper lanceolate, irregularly or obscurely denticulate or subentire, 1 to 3 in. long, the cauline sessile, or the lower ones narrowed to a petiole, the earliest in a basal tuft; calyx-tube 1 to 2½ lines long; petals yellow, without a dark spot at base, commonly drying greenish, orbicular-obovate, 3 to 5 lines long; capsule filiform-linear, attenuate upward, sharply quadrangular, curved or arcuate, or spirally contorted, ¾ to 1¾ in. long.—Gravelly washes, sandy valleys and grassy hillsides, 100 to 5800 ft.: cismontane S. Cal. from Santa Barbara to the San Jacinto Mts. and San Diego Co.; w. side Colorado Desert; n. to Inyo Co.; s. to L. Cal. (Sphaerostigma bistortum Walp.) Var. HÁLLII Jepson n. comb. Leaves pallid with short appressed hairs.—Mohave and Colorado deserts and bordering ranges, rare. (Sphaerostigma hallii Dav.)

16. **O. dentàta** Cav. Stems diffusely branched from the base, 3 to 9 in. high; herbage glabrous or puberulent; leaves linear, mostly tapering to both ends, denticulate, ¼ to 1¾ in. long, often with smaller leaves fascicled in the axils; calyx-tube 1 to 2 lines long; petals yellow, changing to dull red, round-obovate, 2 to 3 lines long; anthers versatile; capsule filiform-linear, arcuate-recurved, 7 to 12 lines long.—Sandy plains, valleys and mountain slopes, 100 to 5000 ft.: coastal S. Cal.; Chile. Apr.-June. (Sphaerostigma dentatum Walp.) Passing into the var. CAMPÉSTRIS Jepson n. comb. Petals (2½ or) 4 to 6 lines long.—San Joaquin Valley; Mohave Desert. (O. campestris Greene). Var. CRUCIÀTA Wats. Petals 3 lines long, often emarginate.—Sacramento Valley.

17. **O. contórta** Dougl. Fig. 667. Stems slender, 1 to several from the base, at first strict, at length diffusely branched, 4 to 16 in. high; herbage glabrous or minutely pubescent; leaves linear, remotely low-denticulate, ½ to 1¼ in. long; calyx-tube ½ to ¾ line long; petals 1 to 1½ lines long, yellow, aging to deep red; anthers innate; capsule narrow-linear, straight and ascending, or with the lower part curved and the upper part ascending, ¾ to 1¾ in. long, ¼ line wide.—Rather dry ground, plains, hillslopes and desert mesas, 100 to 7000 ft., throughout Cal.; n. to Wash., e. to Nev. and s. to northern Mex. (Sphaerostigma contortum Walp. O. strigulosa T. & G.) Var. PÙBENS Cov. Grayish with a short dense hirsute pubescence.—Deserts on e. side Sierra Nevada.

667. Oenothera contorta Dougl.; *a*, habit x ½; *b*, fl. x 2.

18. **O. andìna** Nutt. Stems several from the base, diffuse or ascending, 1 to 4 in. long; herbage finely puberulent or glabrate; leaves linear, 4 to 7 lines long, narrowed at base to a short petiole; flowers in the axils of the densely leafy branches; calyx-tube ½ to ¾ line long; petals yellow, ¾ to 1 line long; capsules linear, a little narrowed upward, straight or nearly so, 3 to 5 lines long.—Valleys and mountain slopes, 4000 to 6500 ft.: Lassen and Modoc Cos.; e. to Utah and Wyo., n. to Wash. (Sphaerostigma andinum Walp.)

19. **O. chamaenerioídes** Gray. Stems slender, 1 to several from the base, simple or branched, erect or ascending, 6 to 11 in. high; herbage glabrous or nearly so; leaves linear-oblong to oblong-ovate, entire or remotely denticu-

late, ½ to 1¼ in. long; flowers commonly few in very loose spikes, the spikes usually nodding; calyx-tube 1 line long; petals white or pinkish, ½ to 1 line long; capsule filiform-linear, straight, ascending or even strict, 1¼ to 2 in. long.—Sandy washes and mesas and dry mountain slopes, 1400 to 7400 ft., infrequent: Inyo Co.; s. Sierra Nevada in Kern Co.; Mohave and Colorado deserts. (Sphaerostigma chamaeneroides Gray. O. deserti Jones.)

20. **O. refrácta** Wats. Stems 1 to several from the base, simple or mostly sparingly branched, 7 to 13 in. high; herbage glabrous or slightly puberulent, sometimes a little glandular; leaves mostly basal or on lower part of plant, linear-lanceolate, or the upper narrow-linear or filiform, 1 to 1¾ in. long, the lower ones shortly petioled; flowers in spikes, the spikes somewhat nodding in bud; calyx-tube narrow-funnelform, 1½ to 2 lines long; petals yellow, 1½ to 2 lines long; capsules filiform-linear, cylindric, straight or somewhat curved or contorted, mostly sharply refracted, 1¼ to 1½ in. long.—Desert plains and dry slopes, 100 to 4500 ft.: Inyo Co.; Mohave and Colorado deserts; e. to Ariz. and Utah. (Sphaerostigma refractum Small.)

21. **O. alýssoides** H. & A. Stems several from the base, stout, spreading, or often one, simple and erect, 4 to 21 in. high; herbage glabrous or sparingly puberulent; bark exfoliating in broad strips, white and shining; leaves narrow-ovate or lanceolate to narrow-obovate or oblanceolate, denticulate or entire, ½ to 4 in. long, attenuate into a very short petiole or the basal with petioles ¼ to as long; flowers in spikes, the spikes densely many-flowered, nodding or coiled at tip, or erect; calyx-tube tubular but a little widened upward, 1½ to 2¼ lines long; petals white, fading pink, obovate to round-ovate, very shortly clawed, 1½ lines long; capsule quadrangular, or sometimes terete, little attenuate upward, recurved-contorted, 5 to 8 lines long, crowded on the axis.—Sandy soil, 4000 to 5000 ft.: Shasta, Siskiyou and Modoc Cos.; n. to Can., e. to Rocky Mts. (Sphaerostigma alyssoides Walp.) Var. DECÓRTICANS Jepson n. comb. Fig. 668. Herbage usually glabrous or glabrate; spikes mostly nodding; capsules stout, strongly attenuate upward, much thickened (1 line thick) at base.—Desert plains and dry mountain slopes, 500 to 5000 ft.: Colorado and Mohave deserts and bordering mountain slopes; San Antonio Mts.; Santa Barbara Co. to Monterey Co.; inner South Coast Range; Greenhorn Range; Inyo Co. (O. gauraeflora T. & G.) Var. VILLÒSA Wats. More or less villous throughout.—Mono Co. and n. and e.

668. Oenothera alyssoides var. decorticans Jepson; fr. branch x ⅔.

22. **O. cárdiophýlla** Torr. Stem erect, freely branching, 1 to 2½ ft. high, mostly leafy on lower part; herbage villous-pubescent, or the leaves subglabrate; leaves round-ovate, cordate at base, dentate or denticulate, ½ to 2¼ in. long, on petioles ½ to as long; flowers in dense terminal spikes, the spikes nodding at apex; calyx-tube 3 to 4 lines long; petals yellow, aging a lively brick red, 3 lines long; capsules strictly erect or ascending, 1 to 1¾ in. long.—Desert cañons and gullies, 10 to 2000 ft.: Panamint Mts.; s. to the Colorado Desert; e. to Ariz. (Chylismia cardiophylla Small.) Var. LONGITÙBA Jepson n. var. Calyx-tube 9 lines long; petals 6 lines long.—Along Colorado River (Needles, J. Grinnell, type).

23. **O. scàpoidea** T. & G. Stems several from the base, erect, 9 to 14 in. high, with mostly basal leaves; herbage glabrous or nearly so; leaves oblong-lanceolate, or sometimes ovate, denticulate, dentate or lyrately pinnatifid, with large terminal lobe and few small lateral ones, purple-veined, ½

to 6 in. long, on petioles ½ to nearly as long; flowers in a dense terminal spike coiled at tip, the inflorescence flowering unilaterally; calyx-tube 1 to 2 lines long; petals white (rarely yellow), 2 to 3 lines long; stigma greenish; capsules linear-oblong, quadrangular, midnerve of the valves rounded, ridge-like, 4 to 10 lines long, on pedicels 2½ to 7 (or 9) lines long.—Sandy desert mesas, stony slopes and plains, 300 to 4000 ft.: Colorado and Mohave deserts; along e. side Sierra Nevada from Inyo Co. to Lassen Co.; n. to eastern Ore. (Chylismia scapoidea Small.) Var. AURANTÌACA Wats. Petals bright rose-color or orange; capsule often puberulent.—Mohave Desert. (O. clavaeformis Torr.) Var. PURPURÁSCENS Wats. Petals white, changing to pinkish.—With the species in Cal. Var. TÓRTILIS Jepson n. var. Capsules 1 to 1¼ in. long, straight or nearly straight but twisted.—Panamint Mts. (Wild Rose Cañon, Jepson 7131, type).

669. Oenothera brevipes Gray; *a*, fl. stem x ⅓; *b*, leaf x ⅓; *c*, fl. x 1.

24. **O. brévipes** Gray. Fig. 669. Similar to no. 23; stems coarser, 4 to 22 in. high; herbage on lower parts villous; leaves ovate to lanceolate, subentire or denticulate or lyrately pinnatifid with few and small lateral lobes, 1 to 3 in. long, on petioles ¼ to about as long; flowers in spikes, the spikes nodding in the bud; calyx-tube 1 to 2 lines long; petals golden-yellow, somewhat quadratish, truncatish or retuse, 2 to 6 lines long; capsule 1 to 2¾ in. long, spreading or refracted, the pedicels commonly 1½ to 3 lines long.—Desert washes, 100 to 7000 ft.: Colorado and Mohave deserts; Inyo Co.; e. to Ariz. and southern Nev. (Chylismia brevipes Small.) Var. MULTIJÙGA Jepson n. comb. Stem nearly naked, widely branched above; leaves nearly all basal, pinnately divided into many subequal lobes.—Inyo Co.; e. to southern Utah. (O. multijuga Wats.)

9. EÙLOBUS Nutt.

Glabrous or glabrate annual herb. Leaves few, alternate. Flowers sessile along the virgate branches. Calyx-tube none or scarcely any, its limb 4-parted, reflexed. Petals 4, rhombic-ovate, light yellow, turning pink. Stamens 8, those alternate the petals with oblong anthers, those opposite with smaller globose anthers. Ovary 4-celled; stigma capitate. Capsule linear, quadrangular, imperfectly 4-celled, strongly refracted. Seeds naked. (Greek eu, well, and lobos, lobe.)

1. **E. califórnicus** Nutt. Stem stout, simple or with few virgate ascending branches, 1½ to 3 ft. high, the branches ending in few-flowered spikes; leaves lanceolate in outline, unequally dentate or pinnatifid, 1 to 3 in. long, mostly short-petioled, the cauline leaves very sparse and the upper much reduced, those of the basal rosette disappearing early; petals 3 to 5 lines long; capsules 2 to 3¾ in. long.—Foothills and valleys, 1000 to 3000 ft., common: coastal S. Cal. from Santa Barbara to San Diego, e. through the Colorado Desert (but rare) to Ariz.

10. GAYÓPHYTUM Juss.

Slender erect annual herbs. Leaves alternate, or the lower opposite. Flowers borne in leafy racemes. Calyx 4-parted down to the ovary. Stamens 8, the alternate 4 short. Ovary 2-celled; stigma capitate. Capsule 4-valved, pediceled. Seeds numerous, in a single row in each cell, naked. (C. Gay, author of a Flora of Chile, and Greek phyton, plant.)

670. Gayophytum diffusum T. & G.; *a*, leafy sect. of stem x ½; *b*, fl. branchlet x ½; *c*, fl. x 2.

Pedicels ¼ to as long as the capsule; branches with scattered leaves; capsule clavate or oblong, mostly torulose, obscurely if at all flattened; seeds erect or suberect.
Style a little dilated upwards, truncate at apex, the stigma discoid; seeds glabrous, smooth or minutely roughened.
Corolla 4 to 5 lines broad; petals white, aging pink..... 1. *G. diffusum.*
Corolla 1½ to 1¾ lines broad; petals white, aging brick-red..2. *G. ramosissimum.*
Style ending in a globose stigma; seeds covered with short sub-appresssed hairs.
Herbage glabrous or nearly so; petals entire..... 3. *G. lasiospermum.*
Herbage grayish-puberulent; petals erosulate....4. *G. helleri.*
Pedicels almost none or very short; branches rather densely leafy; stigma capitate; seeds glabrous.
Capsule narrow-linear, more or less torulose; seeds erect or suberect.. 5. *G. caesium.*
Capsule oblong, strongly flattened, not at all torulose; seeds obliquely ascending.....6. *G. humile.*

1. **G. diffûsum** T. & G. Fig. 670. Stems profusely branched from or above the base, ½ to 2 ft. high, glabrous or with scattered spreading hairs, more or less purplish; bark becoming papery and tending to exfoliate; leaves linear or the lower linear-oblanceolate, glabrous or sparsely strigose, 5 to 8 lines long or the lower 1 to 2 in. long; flowers loosely disposed along the branchlets, strongly heliotropic; calyx-lobes ultimately reflexed in pairs; petals white, turning pink or rose-color, 2 small yellow dots at base, rhomboidal-ovate, (1½ or) 2 to 3 lines long; ovary canescent to glabrous; style a little dilated above the middle, truncate at apex, the stigma discoid; capsule at maturity more or less shrunken-constricted about the seeds and thus torulose, borne on a filiform pedicel 1 to 3 lines long.—Dry open ridges or flats, 4500 to 7000 ft.: Sierra Nevada from Tulare Co. to Siskiyou Co., thence s. to Humboldt Co.

2. **G. ramosíssimum** T. & G. Fig. 671. Similar in habit to no. 1; 6 to 20 in. high; herbage usually puberulent; flower-buds mostly apiculate; flowers tardily or weakly heliotropic; calyx-lobes reflexed-spreading, all distinct; petals sub-orbicular, white, obscurely greenish-yellow at base, in age turning brick-red, ½ to 1 line long; pedicels about ¼ to as long as capsule.—Mountain flats or slopes, 5000 to 9000 ft.: mts. of S. Cal.; Sierra Nevada from Tulare Co. to Shasta Co.; thence s. to eastern Mendocino Co. Var. OBTÙSUM Jepson

671. Gayophytum ramosissimum T. & G.; *a*, fl. branchlet x ½; *b*, fl. x 2.

n. var. Plants 5 to 12 in. high; herbage glabrous; ultimate branchlets filiform, sparsely leafy; flower-buds minute, globose, obtuse; petals white, turning red, ¼ line long, scarcely exceeding the calyx-lobes.—E. Lassen Co. (Beckwith Pass, Jepson 2755, type). Var. PYGMAÆUM Jepson n. var. Dwarf in all its parts, 1 in. high.—Bullfrog Lake, Fresno Co., 11,000 ft. (Jepson 850a, type).

3. **G. làsiospérmum** Greene. Similar to no. 1; petals rose-color, changing to purplish, ½ to ¾ line long.—Mts. of S. Cal. and n. to the southern Sierra Nevada in Tulare Co. Var. ERIOSPÉRMUM Jepson n. comb. Petals 2 to 3 lines long.—Montane: mts. of S. Cal.; Sierra Nevada from Tulare Co. to Shasta Co. (G. eriospermum Cov.)

4. **G. hélleri** Rydb. var. **èrosulàtum** Jepson n. var. Stems diffusely branching from the base, 6 to 8 in. high; herbage grayish, especially the leaves, with a somewhat dense cover of short spreading hairs, the young parts canescent; petals white, turning deep red, elliptic, erosulate all around, ¼ to ⅓ line long; capsules 2½ to 3 lines long, contracted into a pedicel about half as long.—Dry sandy slopes, 4000 to 9700 ft., e. side of Sierra Nevada: Lassen Co. (Beckwith Pass, Jepson 7754, type); White Mts.

5. **G. caèsium** T. & G. Stem subsimple or diffusely branching, 6 to 9 in. high; herbage soft-pubescent or glabrous; leaves linear to narrow-oblanceolate, ½ to ¾ (or 1¼) in. long; flowers very small (⅓ to ½ line long); stigma globose, large; capsule pubescent, 5 to 6 lines long, the pedicel very short (½ to 1 line long).—E. summits or e. side of the Sierra Nevada, 4000 to 5000 ft., from Lassen Co. to Modoc Co.; ne. Humboldt Co.; n. to Ore., e. to Col.

6. **G. hùmile** Juss. Stems erect, simple or with commonly simple ascending branches, 2 to 10 in. high, purplish; herbage glabrous; upper leaves numerous, crowded, usually rather strict, linear-lanceolate to oblanceolate, 6 to 10 lines long, the lower ones sparse, 12 lines long; flowers in the upper axils; petals white, turning pink, about ½ line long, not exceeding the calyx-lobes or scarcely; capsule glabrous, strongly flattened contrary to the partition, markedly furrowed on each side, glabrous, 4 to 5 lines long.—Dry slopes, coniferous forests, 3000 to 8000 ft.: San Jacinto Mts.; San Bernardino Mts.; Sierra Nevada from Tulare Co. to Shasta Co., thence sw. and s. to Humboldt Co. and n. Lake Co.; n. to Wash. and Ida.; Chile (G. pumilum Wats.)

11. GÁURA L.

Herbs with alternate leaves. Flowers white or pink, turning red, borne in spikes or racemes. Calyx-tube above ovary narrow, the calyx-limb 4-cleft, the whole calyx deciduous. Petals 4, entire, with claws. Stamens 8. Ovary 4-celled; ovules 1 in each cell; style long. Fruit nut-like, obovoid, indehiscent or splitting at apex, 1 or 2-seeded. (Latin gauros, superb, some of the species with somewhat elegant flowers.)

Anthers all perfect; filaments with a scale-like appendage at base; stigma 4-lobed.
Anthers oval, attached at the middle; leaves 4 to 12 lines wide; fruit spindle-shaped, 4-ridged, glabrous ..... 1. *G. parviflora.*
Anthers linear, attached a little above the base; leaves ½ to 2 lines wide; fruit ovate, 4-angled, contracted to a cylindric base, pubescent ..... 2. *G. coccínea.*
Anthers attached at the base, those opposite the petals sterile; filaments without appendages; stigma entire ..... 3. *G. heterandra.*

1. **G. parviflòra** Dougl. VELVET WEED. Stem erect with erect branches, 2 to 3 ft. high; herbage hirsute; leaves ovate-lanceolate, entire or obscurely denticulate, 2 to 3 in. long, sessile or nearly so, the lower ones spatulate-obovate, 3 to 4 in. long, gradually narrowed to a narrowly-winged petiole about ¼ to ⅓ as long; flowers in a long somewhat dense leafless spike, 6 to 12 in. long; petals reddish, about 1 line long; fruits spindle-shaped, 4-ridged, 3 lines long.—Providence Mts. (rare in Cal.); Nev. to Wash., N. Dak., La. and Mex.

2. **G. coccínea** Nutt. Stems erect, several or many from the base, forming a bushy plant 8 to 12 in. high; herbage canescent; leaves linear, remotely denticulate or entire, sessile, ½ to 1 in. long; flowers in dense terminal

spikes; petals red, turning scarlet, 3 lines long; fruits short-ovate, strongly 4-angled, abruptly contracted to a cylindric base, 2 lines long.—E. Mohave Desert: Providence Mts.; New York Mts.; e. to Tex., thence n. to Mont.

3. **G. heterándra** Torr. Stems erect, branching, 1 to 1½ ft. high; herbage minutely puberulent; leaves oblong to lanceolate, 1 to 1½ in. long, on slender petioles; petals pink, 1½ to 2 lines long; fruit 1½ lines long.—Montane, 3000 to 4000 ft.: Sierra Nevada from Placer Co. to Kern Co.; s. to the San Bernardino Mts.; w. to Ft. Tejon.

12. CIRCAÈA L. Enchanter's Nightshade

Low slender perennials with thin opposite petioled leaves. Flowers small, white, in terminal and lateral racemes. Calyx-tube slightly produced beyond the ovary, the base nearly filled by a cup-shaped disk, deciduous; lobes 2, reflexed. Petals 2, obcordate. Stamens 2, alternate with the petals. Ovary 1 or 2-celled, each cell 1-ovuled. Fruit 1-celled, 1-seeded, indehiscent, pear-shaped and bristly with hooked hairs. (Circe, sea-nymph, daughter of the Sun and of Perse.)

1. **C. pacífica** Asch. & Mag. Stem from a short rootstock, usually simple, 6 to 14 in. high; herbage glabrous; leaves orbicular to mostly ovate, obtuse to cordate at base, acuminate, obscurely repand-denticulate or almost entire, 1 to 2 in. long, on petioles ¾ to 1 in. long; racemes bractless; flowers ½ line long; calyx white, with a very short tube; fruit ¾ to 1 line long.—Deep shade of woods: Sierra Nevada, 4000 to 7000 ft., from Tulare Co. to Siskiyou Co., thence s. in the Coast Ranges to Marin Co., descending to 200 ft.; infrequent. July.

HALORÀGEAE. Water-milfoil Family

Perennial aquatic herbs, the leaves (in ours) in whorls. Flowers sessile in the axils of leaves or bracts, perfect or unisexual. Calyx-tube coherent with the ovary, the limb very short or obsolete. Petals small or none. Stamens 1, 4, or 8. Ovary 1 to 4-celled; stigmas 1 to 4. Fruit a 1-seeded indehiscent nutlet, or 4-lobed and splitting into 4 nutlets.

Leaves all entire; flowers perfect; stamen 1; ovary 1-celled.....1. Hippuris.
Immersed leaves capillary-dissected; flowers polygamous; stamens 4 or 8; ovary 4-celled...
2. Myriophyllum.

1. HIPPÙRIS L. Mare's Tail

Stems erect, unbranched. Leaves simple, entire. Flowers minute, usually perfect, sessile in the axils. Petals none. Calyx limb a narrow entire rim. Stamen 1, inserted on the anterior edge of the calyx. Style 1, filiform, stigmatic down one side. Ovary 1-celled, becoming a 1-seeded nutlet. (Greek hippos, a horse, and oura, a tail.)

1. **H. vulgàris** L. Stem simple, 1 to 2 ft. long (commonly emersed 4 to 7 in.); herbage glabrous; leaves about 7 to 10 in a whorl, linear, acute, 6 to 9 lines long; fruit nearly 1 line long.—Shallow margins of ponds and about springs, high mts. and along the coast, 10 to 7000 ft., infrequent but widely distributed in Cal.; N. Am., Eur., Asia, Patagonia. May-July.

2. MYRIOPHÝLLUM L.

Emersed leaves entire or pectinate, those under water pinnately divided into capillary divisions. Flowers sessile in the axils of the opposite upper leaves or the whorls forming a terminal interrupted spike. Upper flowers generally staminate, the lowest pistillate, and the intermediate often perfect. Calyx of the pistillate flowers 4-toothed or the teeth none, of the staminate 4-lobed. Petals 4, or none. Stamens 4 or 8. Stigmas 4, recurved and plumose. Fruit splitting at maturity into 4 bony 1-seeded nutlets. (Greek murios, a thousand, and phullon, a leaf.)

Flowers in a terminal interrupted spike; petals fugacious; stamens 8.
Bracts entire or toothed, shorter than the flowers.....1. *M. spicatum.*
Bracts pectinate, longer or shorter than the flowers.....2. *M. verticillatum.*
Flowers in the axils of the emersed linear leaves; petals subpersistent; stamens 4.....
3. *M. hippuroides*

1. **M. spicàtum** L. var. **exalbéscens** Jepson n. comb. American Milfoil. Stems branching, 1 to 2 ft. long; leaves in whorls of 3 or 4, dissected into capillary divisions; whorls of flowers forming an interrupted spike 1 to 4 in. long, the bracts ovate, entire or serrate and usually shorter than the flowers; nutlets 1 line long, fully as thick, rounded on the back.—Lakes and ponds, collected at only a few widely scattered stations in Cal.: Bear Valley, San Bernardino Mts.; San Francisco; Camp Taylor, Marin Co.; Merrillville, Lassen Co.; n. to the arctic, e. to N. Eng. (M. exalbescens Fer.)

2. **M. vérticillàtum** L. Myriad-leaf. Submersed leaves in crowded whorls of 30 and 40, the capillary divisions often finer than those of no. 1; floral leaves pectinate-pinnatifid; spike 2 to 6 in. long; petals of the staminate flower purplish; nutlets somewhat gibbous at base.—Clear Lake (rare in Cal.); Wash. to N. Y.; Eur., Asia, n. Afr.

3. **M. hippùrioides** Nutt. Western Milfoil. Stems simple or branching, 1 to 2 ft. long; leaves in whorls of 4 or 5; emersed ones linear, about ½ line wide, conspicuously or obscurely serrate or the uppermost nearly entire, 3 to 5 lines long; submersed ones pinnately dissected into capillary divisions, ½ to 1½ in. long; flowers chiefly in the axils of the emersed leaves; petals white, obovate; nutlets less rounded than in no. 1. — Stockton; Mt. Hanna, Lake Co. (rare in Cal.); N. Am.

ARALIÀCEAE. Aralia Family

Ours perennial herbs. Closely allied to Umbelliferae, but the stems solid, the petals not inflexed and the ovary 2 to 5-celled. Petals, stamens and styles 5. Calyx-tube coherent with the ovary, its limb a mere rim with 5 salient teeth. Fruit berry-like, containing as many 1-seeded nuts as there are carpels.

1. ARÀLIA L.

Leaves alternate, very large, compound. Flowers small, whitish, borne in panicled umbels, the pedicels pointed. Styles united to the middle. Embryo minute. (Derivation uncertain.)

1. **A. californica** Wats. Elk Clover. Fig. 672. Stems simple, stout, 6 to 10 ft. high, arising from a large rootstock with milky juice; herbage glabrous, subulate-scabrous on the main stem; leaves ternate, then pinnately 3 to 5-foliate, 1 to 5 ft. long; leaflets ovate, sometimes elliptic, serrate, acuminate, subcordate at base, ½ to 1 ft. long; flowers 1½ lines long, on pedicels ½ in. long; panicle 1 to 1½ ft. long; ovary red, becoming a globular black berry 2½ lines in diameter.—Shaded cañons in moist spots and along living mountain streams: Coast Ranges (except the inner ranges) from Humboldt and Trinity Co. s.; Sierra Nevada from Plumas Co. to Mariposa Co.; s. to coastal S. Cal.; n. to southwestern Ore. July.

672. Aralia californica Wats.; *a*, leaf x ⅛; *b*, fl. branchlet x ¼; *c*, fl. x 3; *d*, fr. x 1½.

UMBELLÍFERAE. Parsley Family

Herbs with commonly hollow stems and often dilated petioles. Leaves commonly alternate or basal, compound (sometimes simple), usually much incised or divided. Flowers small, in compound umbels, or the umbels some-

times simple or capitate. Umbels when compound with the peduncle divided at summit into a number of rays, each ray bearing a secondary umbel termed an umbellet. Umbellets commonly subtended by bractlets (forming an involucel); rays commonly subtended by bracts (forming an involucre). Calyx-tube wholly adnate to the ovary; calyx-teeth small, sometimes obsolete. Petals 5, usually with an inflexed tip. Stamens 5, inserted on an epigynous disk. Ovary inferior, 2-celled, one hanging ovule in each cell. Styles 2, united below and forming a swollen or cushion-like base (stylopodium). Fruit consisting of two carpels united by their faces (commissure), flattened laterally (i. e., flattened sidewise or contrary to the commissure), or flattened dorsally (i. e., each carpel flattened on the back or parallel with the commissure), or not flattened at all. Each carpel with 5 ribs or ridges, one down the back (dorsal rib), 2 on the edge near the commissure (lateral ribs), and 2 between the dorsal and lateral ribs (intermediate ribs). Between the ribs are the spaces called intervals:—the dorsal intervals are those next to the dorsal rib; the lateral intervals are those next to the lateral ribs. Beneath the intervals (in the tissue of the pericarp), as also on the commissural side, are oil-tubes. Carpels 1-seeded, splitting apart at maturity, each borne on a filiform division of the receptacle (or carpophore) which is prolonged between them. The "seed-face" is against the commissure. Embryo small; endosperm cartilaginous.—The inflorescence is frequently irregularly compound; in a few genera the fruit has no ribs, and in others no oil-tubes. The number of oil-tubes in a given species is, generally speaking, a reliable character but it should be noted that there is here, also, more or less variation. The character of the ribs and oil-tubes should be ascertained by examination of perfectly mature fruit. Many of the species are poisonous or have poisonous parts, although many others, such as Parsley, Carrot and Parsnip, have edible organs and are classed as food plants.

A. Fruit bearing prickles, bristles, scales or tubercles.

Ribs none; oil-tubes none except in no. 2.
- Fruit covered with hyaline scales; flowers greenish-white or blue, in dense heads; prickly perennial herbs.....1. ERYNGIUM.
- Fruit bur-like, covered with hooked prickles.
  - Flowers yellow or purple, mostly in head-like clusters; perennials..2. SANICULA.
  - Flowers white, in compound umbels; annuals.....3. ANTHRISCUS.

Ribs present; flowers white.
- Oil-tubes none or obscure.
  - Fruit with an elongated beak several times longer than the muriculate body; annuals.....4. SCANDIX.
  - Fruit not beaked or with a short beak several times shorter than the smooth body; ribs bristly; perennials.....5. OSMORRHIZA.
- Oil-tubes present, usually conspicuous.
  - Ribs armed with bristles.
    - Fruit somewhat flattened dorsally; spines barbed; calyx-teeth obsolete; umbel compound.....6. DAUCUS.
    - Fruit flattened laterally; bristles hooked; calyx-teeth obvious.
      - Umbels subcapitate, opposite the leaves; fruit prickly on one carpel, warty on the other.....7. TORILIS.
      - Umbels compound, terminal and lateral; fruit prickly on both carpels..8. CAUCALIS.
  - Ribs not armed, inconspicuous; fruit tuberculate-roughened; umbels irregularly compound.....9. APIASTRUM.

B. Fruit not prickly or tuberculate nor scaly (sometimes hairy).

I. LEAVES SIMPLE; UMBELS SIMPLE OR PROLIFEROUS.

Leaves alternate or in a basal tuft; carpels with filiform ribs; stems creeping; perennials.
- Oil-tubes none; leaves orbicular or peltate.....10. HYDROCOTYLE.
- Oil-tubes solitary; leaves consisting of hollow cylindrical petioles.....24. LILAEOPSIS.

Leaves opposite; carpels without ribs; stems slender, weak; annuals.....11. BOWLESIA.

2. LEAVES PINNATELY OR TERNATELY COMPOUND OR DECOMPOUND; UMBELS COMPOUND.

a. Ribs of the fruit not winged; fruit not flattened dorsally, sometimes somewhat laterally flattened.

Flowers white, rarely pinkish, or at least not yellow.
- Oil-tubes none.
  - Fruit linear or elongated (½ to 1 in. long); stems not dotted...5. OSMORRHIZA.
  - Fruit ovate (1½ lines long); stem purple-dotted.....12. CONIUM.
- Oil-tubes present.
  - Oil-tubes solitary in the intervals (see also no. 17).
    - Petals conspicuously unequal; lower leaves with broad leaflets, the upper dissected.....13. CORIANDRUM.

Petals equal or essentially so.
Umbels subsessile in the forks and terminal on the branches. 14. APIUM
Umbels terminal on the branches.
Bracts 3-parted to the middle into filiform divisions, closely reflexed; upper leaves ternately decompound and dissected. 15. AMMI.
Bracts entire or merely toothed, spreading or rarely reflexed; leaves pinnate or bipinnate.
Leaflets entire; ribs filiform; plants of dry ground or moist meadows. 16. CARUM.
Leaflets serrate; plants of marshes or stream banks.
Ribs corky but distinct.
Styles short (about ⅓ or ⅕ as long as the fruit; fruit broadly ovate or roundish. 18. CICUTA.
Styles long (about ½ as long as the fruit); fruit subcylindric. 19. OENANTHE.
Ribs confluent, forming a continuous corky covering. 20. BERULA.
Oil-tubes 2 or more, at least in some of the intervals.
Ribs, or some of them, corky.
Leaves simply pinnate; stems leafy; ribs all corky; marsh or aquatic plants. 21. SIUM.
Leaves once or twice ternate, all basal; lateral ribs corky-thickened, the others slender; slopes towards the arid interior. 22. OROGENIA.
Ribs not corky-thickened.
Pedicels of the flowers equal or nearly so; calyx-teeth not rigid.
Leaves once to thrice ternate or pinnate; mostly tall plants.
Leaflets linear, mostly entire; ribs filiform. 17. EULOPHUS.
Leaflets ovate, incised; ribs strong, acute. 23. LIGUSTICUM.
Leaves pinnate or bipinnate, the divisions or leaflets oblong, entire; alpine dwarf. 25. PODISTERA.
Pedicels of the sterile flowers surpassing or equaling the fruit; sterile calyx-teeth rigid-subulate, very prominent. 26. OREONANA.
Flowers yellow.
Stems of medium height, the leaves mostly basal; leaflets broad. 27. VELAEA.
Stems very tall, leafy; leaves dissected into filiform segments. 28. FOENICULUM.

b. Some or all the ribs of the fruit winged.

Lateral ribs winged, the dorsal and intermediate ribs filiform; fruit flattened dorsally.
Corollas of marginal flowers of umbel radiately enlarged; oil-tubes reaching only half way to base of fruit; tall coarse plants. 29. HERACLEUM.
Corollas all alike; oil-tubes as long as the fruit (except in no. 32).
Leaves and peduncles arising from the root-crown, or from only a very short proper stem.
Lateral wings of fruit corky-thickened; flowers commonly yellow; tall plants with large leaves. 30. LEPTOTAENIA.
Lateral wings thin; flowers yellow, white or purple; low plants with medium or small leaves. 31. LOMATIUM.
Stems tall, leafy.
Dorsal and intermediate ribs 3; flowers yellow.
Leaves pinnate, the leaflets ovate, toothed. 32. PASTINACA.
Leaves ternately compound and dissected into filiform segments. 33. ANETHUM.
Dorsal and intermediate ribs apparently 5; leaves simply pinnate; flowers white. 34. OXYPOLIS.
Lateral, dorsal and intermediate ribs all winged or very prominent.
Tall plants with leafy stems; flowers white.
Umbellets not capitate.
Ribs not corky-thickened; fruit flattened dorsally; petioles not inflated.
Leaflets incised or deeply toothed; oil-tubes solitary in the intervals. 35. CONIOSELINUM.
Leaflets not incised, merely serrate or toothed or entire; oil-tubes 1 to 3 in the intervals. 36. ANGELICA.
Ribs very thick and corky; fruit slightly flattened laterally if at all; petioles inflated. 37. COELOPLEURUM.
Umbellets capitate; fruit cuneate-obovate, flattened dorsally, pubescent. 38. SPHENOSCIADIUM.
Mostly low plants, the leaves and peduncles all basal; oil-tubes several in the intervals; flowers white, yellow or purple; fruit flattened dorsally or not at all. 39. CYMOPTERUS.

1. ERÝNGIUM L. BUTTON SNAKEROOT

Perennials with clustered coarse fibrous roots, often dichotomously branching stems, prickly involucres and often prickly leaves. Leaves opposite, or the upper sometimes alternate, commonly oblanceolate and spinulose-serrate or incised, or the basal, when growing in water, with fistulous petioles and the blade more or less obsolete. Flowers greenish-white or bluish, condensed in heads; heads terminal on the branches or on short peduncles in the forks;

bracts spinose, conspicuous; bractlets usually spinose-tipped. Calyx-lobes (or sepals) persistent on the fruit. Fruit covered with whitish thin scales; ribs obsolete. Oil-tubes none or obscure. (Greek name used by Dioscorides.)

Sepals entire.
- Heads very blue.....1. *E. articulatum.*
- Heads greenish, seldom blue.
  - Blades of lower cauline leaves about 1¼ in. long, the petioles several times as long.....2. *E. alismaefolium.*
  - Blades of lower cauline leaves little or not at all exceeded by the petioles.
    - Bracts mostly entire (sometimes with a pair of spiny teeth or bristles).
      - Styles in fruit little or not at all exserted beyond calyx-lobes; bracts and bractlets glabrous.
        - Stem diffusely branched from base; leaves serrate or incised; bracts callous-margined.....3. *E. armatum.*
        - Stem erect, simple below; leaves twice pinnately parted; bracts scarious-winged at base.....4. *E. pinnatisectum.*
      - Styles in fruit conspicuously exserted beyond calyx-lobes; bracts and bractlets puberulent.....5. *E. longistylum.*
    - Bracts more or less spiny-toothed or bristly.
      - Plants prostrate or low-diffuse.
        - Stems thickened, nearly simple, clustered at base; basal leaves pinnatifid.....6. *E. minimum.*
        - Stems slender, freely branched, not clustered at base; basal leaves oblanceolate, spinose-toothed.....7. *E. aristulatum.*
      - Plants erect.
        - Bractlets not spiny-toothed.....8. *E. jepsonii.*
        - Bractlets spiny-toothed.
          - Leaves merely spinose-toothed or somewhat incised; bracts and bractlets spiny-toothed only towards base.....9. *E. vaseyi.*
          - Leaves laciniately parted into remote spinulose-toothed segments; bracts and bractlets spiny-toothed except towards tip.....10. *E. castrense.*

Sepals pinnately 3 to 5-cuspidate.....11. *E. globosum.*

1. **E. árticulàtum** Hook. BEE-THISTLE. Stem erect, dichotomously branched above, usually with a pedunculate head in the forks, 2 to 3 ft. high; herbage with a strong disagreeable odor; lower leaves fistulous, elongated, jointed, with or without a lanceolate or ovate nearly parallel-veined entire to spinulose-laciniate blade; upper leaves sometimes opposite, more or less laciniate; heads ovoid, 4 to 8 lines high, blue; bracts narrowly linear-lanceolate, cuspidate-tipped, more or less spinulose-serrate, 6 to 10 lines long, deflexed; bractlets lanceolate, entire, or somewhat spiny-toothed, more or less scarious-margined, surpassing the sepals; sepals lanceolate, 1½ lines long, tapering into a short spine, equaled or surpassed by the styles.—River marshes and marshy meadows: lower San Joaquin River; Sacramento Valley; n. to Siskiyou and Modoc Cos.; Ore. to Ida. Var. BÀKERI Jepson. Stem simple for more than half its length, then sparsely branched, 1 to 1½ ft. high; leaf blades of basal leaves ovate, 1¾ to 2 in. long, the petiole much elongated; heads ovate to globose, bluish, on longish pedunecles, 4 to 5 lines high; bracts linear-lanceolate, pinnately spinescent, longer than the heads, spreading or often deflexed; bractlets with a pair of spinose teeth above the middle, scarious-margined at base, equaling or slightly exceeding the sepals; sepals ovate, ¾ line long, tapering rather abruptly into a short cusp, exceeded by the styles.—Modoc Co. This is an apparent intergrade to no. 2.

2. **E. alismaefòlium** Greene. Main stem 1 to 2 in. high, then parted into 3 to 5 diffuse dichotomous branches, at first much shorter than the leaves, later often exceeding them; basal leaves ½ to 1¼ ft. long, consisting of elongated petioles with or without short (1¼ in. long) blades; petioles terete, jointed, passing above into flat spinose ones without joints; upper leaves similar but much smaller; heads usually pedunculate, nearly globose, 3 to 3½ lines high; bracts subulate-lanceolate, usually somewhat longer than the heads, 4 to 5 lines long, with or without a few spinose bristles, somewhat scarious-margined at base; bractlets subulate-lanceolate, a little exceeding the flowers, with conspicuous scarious margins below (broadening downward), with or without a few bristles; sepals ovate-oblong, scarious margined, ½ line long, tapering into a cuspidate-bristly tip; styles longer than the sepals.—Modoc Co.

3. **E. armàtum** C. & R. COAST ERYNGO. Fig. 673. Stem diffusely branching, 3 to 5 or 10 in. long; leaves broadly oblanceolate, incised or merely

serrate, the teeth spinose; bracts and bractlets very prominent, broadly lanceolate, strongly spinose-tipped, with a callous margin, entire or with a pair of spinulose teeth below, sometimes scarious-winged at the very base, 3 to 7 lines long; sepals ovate, ¾ line long, usually exceeding the styles, narrowed at apex into a sharp point or cusp less than half as long. — Lowlands near the coast from Monterey Co. to Humboldt Co.; often abundant.

4. **E. pinnàtiséctum** Jepson. Stem erect, branching above, 8 to 14 in. high; basal leaves 6 in. long, tapering into a flat winged petiole, pinnately parted into narrow rather remote segments, these spinulose-toothed or -parted; upper leaves similar or merely spinose-toothed, the petiole short or lacking; heads 3½ to 4 lines high; bracts entire, 4 to 5 lines long, with wide scarious margin at base forming a lobe or tooth above; bractlets shorter, similar; sepals lanceolate, 1 line long, tapering into a spine about ½ as long; styles exceeded by sepals.—Sierra Nevada foothills in Tuolumne Co.

673. Eryngium armatum C. & R.; *a*, leaf x ½; *b*, infl. x ¾; *c*, bract x 4; *d*, fr. x 4; *e*, sect. carp. x 7.

5. **E. longistŷlum** C. & R. Stem low (4 to 8 in. high), branching throughout and spreading; basal leaves narrow, pinnately cut into distant almost spine-like segments; heads globose, about 1¾ lines high; bracts narrowly lanceolate, spreading, minutely puberulent, much longer than the heads, 2¾ to 3¾ lines long, mostly entire, scarious-margined at base; bractlets similar, but narrower, and with broader scarious margins at base; sepals lanceolate, scarious-margined, ½ line long, tapering above into a weak acuminate tip; styles very much longer than the sepals.—W. San Luis Obispo Co.

6. **E. mínimum** C. & R. Low, depressed-tufted, the stems several to many, nearly simple, thickened toward the base and markedly retrocurved, 1 to 4 in. long; leaves mostly basal, 2 to 6 in. long, merely cleft and toothed to pinnately divided with cleft or toothed ovatish-segments, the teeth and petioles more or less spinose; heads on very short peduncles, nearly globose, 2½ to 3½ lines high; bracts broadly lanceolate, equaling or slightly exceeding the heads, the lower ⅔ with spinose bristles; bractlets broadly linear-lanceolate, a little longer than the flowers, with a conspicuous scarious margin below, at the top of which and just above are a few bristles; sepals ovate, scarious-margined, ½ line long, with an abruptly cuspidate-bristly tip about as long; styles exceeding the sepals.—N. Sierra Nevada (Nevada Co. to Plumas Co.)

7. **E. arístulàtum** Jepson. Stems prostrate or low-diffuse, very slender, 10 to 15 in. long, basal leaves tapering into a long petiole, 4 in. long (including the petiole), the short blade spinose-toothed and with a few lanceolate segments; cauline leaves opposite, sessile, spinulose-serrate; heads very numerous, 2½ to 3½ lines long; bracts exceeding the head, about 4½ lines long, densely spinescent at base; bractlets spinose, the body narrowly lanceolate, inversely sagittate-winged from the base upward, the lobes of the wings thus forming sinuses, in each of which are borne 1 to 3 awns surpassing the breadth of the wing; sepals ovate-lanceolate, hyaline-margined, 1 line long, tapering into a cuspidate-bristly tip, exceeded by the long styles. —Dry lake beds, Lake Co.

674. Eryngium vaseyi C. & R.; *a*, plant x ¼; *b*, terete leaves x ¼; *c*, fr. branch x ½; *d*, fr. x 3; *e*, sect. carpel x 7; *f*, bractlet x 2.

the base and diffusely branching, the heads about 2¾ lines high; bracts narrow and rigid, with a few spinose bristles and with or without a narrow scarious margin at base, 3½ to 6 lines long; bractlets similar but with a short broad scarious margin below, usually without bristles; sepals ovate, ½ line long, tapering above into a cuspidate-bristly tip.—Sandy ground, San Luis Obispo Co. to San Diego Co. and L. Cal. (E. parishii C. & R.)

9. **E. vàseyi** C. & R. COYOTE-THISTLE. Fig. 674. Plants growing in shallow vernal pools and showing two vegetative stages: earliest leaves all terete, jointed, and basal, disappearing with the drying up of the pools and succeeded by leafy stems; stems stout, erect, more or less branching, commonly 8 to 13 in. (or sometimes 2 ft.) high; lower leaves narrowly oblanceolate, spinulose, somewhat incised or bearing small lanceolate lobes below, 4 to 8 in. long, the upper much shorter; heads 3½ (or 2½ lines) high; bracts spinose, spinulose toward the base, 6 to 10 lines long, much surpassing the bractlets; bractlets similar, surpass-

8. **E. jepsònii** C. & R. BUTTON-THISTLE. Plants growing in shallow vernal pools, the earliest leaves all basal and consisting of terete hollow jointed petioles, ½ to 1½ ft. long, these disappearing with the drying up of the pools, and leafy stems arising; stems slender, freely branching, 1¼ to 1¾ ft. high; leaves oblanceolate, spinulose, sometimes incised, the lower narrowed at base to a slender spinulose petiole, the upper short-petioled or sessile; heads 3 to 3½ lines high, surpassed by the bracts; bracts rigid, 4 to 10 lines long, with few short bristles at base; bractlets lanceolate, with scarious margin at base, broader upwards, not spinulose; sepals oblong or lanceolate, 1 line long, narrowed abruptly into a spine less than half as long, exceeded by the long styles.—Low places in valley fields and flats in the hills, Napa Co. to Santa Clara Co. Var. PARÍSHII Jepson. Stems slender, erect or spreading, much branched at base, ⅓ to 1⅓ ft. high; basal leaves laciniate-toothed or parted into remote spinose-toothed segments, tapering into a long somewhat spiny-toothed petiole; inflorescence beginning near

675. Eryngium castrense Jepson; *a*, fr. branchlet x ½; *b*, leaf x ½; *c*, bractlet x 1½; *d*, fr. x 5; *e*, sect. carp. x 12.

ing the flowers; fruit with abruptly cuspidate sepals longer than the short styles.—Low places in fields, Sacramento Valley, w. to Mendocino Co. and s. to Monterey Co. May-June.

10. **E. castrénse** Jepson. Fig. 675. Stem stout, very erect, simple below, branched above, 1½ to 1¾ ft. high; cauline leaves laciniately divided into rather remote very narrow segments, these again cleft or toothed, the margin of the divisions and the ligulate rachis spinose; leaves at the upper forks bracteose-foliaceous, pinnately spinose-cleft, somewhat recurving, 1¼ to 1½ in. long; heads mostly short-peduncled, 4 to 5 lines high, twice exceeded by the bractlets; bracts moderately rigid, pinnately spiny-toothed except toward tip, at base more or less scarious margined and densely spinose dorsally, ¾ to 1 in. long; bractlets similar but with broadly scarious margined base which encloses the fruit; sepals about 1 line long, tapering into a short spine.—Sierra Nevada foothills from Tuolumne Co. to Butte Co. Var. VALLÍCOLA Jepson. Bracts and bractlets shorter and less markedly spinescent, in this character approaching no. 9.—Sierra Nevada foothills from Mariposa Co. to Butte Co.

11. **E. globòsum** Jepson. Stems 1 to several from base, branching above, 14 to 20 in. high; basal leaves pinnately divided into narrow distant segments, these more or less spinose-toothed or cleft, the petioles spinose-winged and at base somewhat clasping, the entire leaf 5 in. long; cauline leaves similar but smaller with short spinosely winged petiole, the uppermost more or less bracteose, very spiny at base; heads remarkably globose, mostly on short stout peduncles, 5 lines in diameter, not exceeded by the bractlets except the terminal ones; bracts rigid, spine-tipped and pinnately spinose, somewhat scarious at base, 4 to 5½ lines long; bractlets pinnately 2 or 3-spinose, with broad scarious margin at base, the margin 1 or 2-spinose above; lateral bractlets equaling the flowers, the terminal ones much longer, all falling with the fruit; sepals ovate, 1 line long, pinnately 3 to 5 spiny-toothed (rarely entire), the apical spine ½ line long; styles scarcely exserted; fruit 1½ lines long.—Flats in and near the Sierra Nevada foothills in Tulare Co. Var. MÈDIUM Jepson. Bractlets conspicuously exserted from the heads, in this respect approaching no. 9.—Cathay foothills, Mariposa Co.

676. Sanicula arctopoides H. & A.; *a*, habit x ¼; *b*, head x 1; *c*, sterile fl. x 5; *d*, fruit x 5; *e*, cross sect. of carpel x 5.

2. SANÍCULA L. SNAKE-ROOT

Glabrous perennials with naked or few-leaved stems, usually much divided leaves, and irregularly compound, few-rayed umbels. Involucres of leaf-like toothed bracts. Involucels of small usually entire bractlets. Flowers greenish, yellow or purple, of two sorts, perfect (fertile) and staminate (sterile), both kinds in the same umbellet, the staminate often pediceled. Umbellets capitate and here called "heads." Calyx-teeth slightly foliaceous, persistent. Fruit subglobose or obovoid, without ribs, densely covered with tubercles which often end in hooked prickles. Oil-tubes many and irregularly distributed. (Diminutive, derived from Latin sanare, to heal; certain species used in medicine.)

A. Fruit pediceled or stipitate; leaves palmately lobed or divided; stem or stems from a stoutish taproot.

Bractlets conspicuous, much exceeding the heads; plants prostrate or decumbent..... 1. *S. arctopoides.*

Bractlets inconspicuous, not exceeding the heads; plants erect.
Leaf divisions broad, not toothed to the very base; common.....2. *S. menziesii.*
Leaf divisions narrow, decurrent below into a conspicuously toothed rachis; rare.... 3. *S. arguta.*

B. Fruit neither pediceled nor stipitate.

Stem or stems from the more or less thickened crown of a taproot.
Flowers purple (yellow in the vars.); leaves bipinnatifid, the main divisions decurrent on the toothed rachis.....4. *S. bipinnatifida.*
Flowers yellow.
Leaves entire or some 3-parted; S. F. Bay.....5. *S. maritima.*
Leaves not entire.
Leaves palmately cleft or divided, the main divisions confluent below; coast species.....6. *S. laciniata.*
Leaves ternate, the main divisions on distinct petiolules; Sierra Nevada, San Bernardino Mts.
Plants low, the spreading peduncles arising in a cluster from near the base.....7. *S. nevadensis.*
Plants erect, the peduncles arising singly along the stem..... 8. *S. septentrionalis.*

Stems from a tuberous root.
Leaves twice or thrice pinnate, of distinct small leaflets; fruit tuberculate, the tubercles tipped with hooked bristles; tuber vertically elongated..9. *S. bipinnata.*
Leaves twice or thrice ternate, then pinnately dissected.
Tuber globose; fruit tuberculate, not bristly; flowers yellow.....10. *S. tuberosa.*
Tuber elongated, fleshy, branched below; fruit with its upper tubercles tipped with hooked bristles; flowers salmon-color.....11. *S. saxatilis.*

1. **S. árctopoides** H. & A. FOOTSTEPS-OF-SPRING. Fig. 676. Prostrate or decumbent, the plants 4 to 8 in. broad, conspicuous because of the yellowish foliage; main stem from a taproot, very short, bearing a tuft of leaves and several divergent naked branches often longer than the leaves, each branch bearing an umbel of 1 to 4 rays; rays short or as much as 5 in. long; leaves 2 to 2½ in. broad, 2 to 4½ in. long, including the broadly margined petiole, palmately parted into 3 divisions which are again cleft, the whole margin laciniately cut into slender unequal teeth, almost as if fringed, or again, the lanceolate spreading segments subentire; bracts similar; heads 3 lines in diameter, surrounded by conspicuous involucels of 8 to 13 oblong entire bractlets 5 to 7 lines long, or 4 or 5 much shorter than the others; flowers yellow; fruit 1 to 1½ lines long, naked at base, with strong bristles above.—Open or brushy hills of the seaward Coast Ranges from Monterey to Humboldt Co.; n. to B. C. Also called Yellow Mats.

677. Sanicula menziesii H. & A.; *a*, leaf x ½; *b*, fr. branchlet x ½; *c*, fr. x 5; *d*, sect. carp. x 6.

2. **S. menziésii** H. & A. GAMBLE WEED. Fig. 677. Stem 1 to 3½ feet high, from a stoutish taproot, simple below, paniculately branching above; leaves round-cordate in outline, 1 to 3 in. broad, palmately and deeply 3 to 5-lobed, the broad segments sharply lobed or incised, with mucronate teeth; rays few, ¼ to 2 in. long; bracts small, leaf-like; bractlets 6 to 8, small, entire; flowers yellow, the sterile ones short-pediceled or nearly sessile; fruit covered with strong bristles, 1½ lines long, distinctly stipitate, 4 to 9 in each head, at length divergent.—Shady woods of the foothills: coastal S.

Cal.; Coast Ranges; Sierra Nevada; n. to B. C. Var. NUDICAÚLIS Jepson. Branches about 10, sub-basal, somewhat scapiform; leaves long-petioled, thinnish, less deeply parted, sinuses more nearly closed and the segments less lobed.—Coast Ranges; Amador Co. Var. PEDÀTA Jepson. Robust, 3 to 5 ft. high; leaves thickish, dark green, pedately divided into cuneate segments (especially the cauline), 3 to 4 in. broad, the teeth bristle-tipped.—Elk Mt., Lake Co.; Calistoga. Var. FOLIÀCEA Jepson. Low but very leafy, the bracteal leaves very large.—San Francisco Bay; Kelseyville, Lake Co.

3. **S. argùta** Greene. Stem sparingly branched, from the crown of a thickened taproot, 8 to 14 in. high; leaves mainly basal, 1 to 3 in. long, palmately 5- to 7-divided, the middle division largest and often distant, the lower pair of divisions smaller than the lateral pair, all more or less pinnately parted or cleft and toothed and each decurrent to the base, forming a broad toothed wing; ultimate segments 2 to 3 lines broad; midribs and upper side of petioles minutely glandular; petioles 2 to 5 in. long; cauline and bracteal leaves reduced or sometimes large; rays 3 to 5 in an umbel, 1 to 4 in. long; flowers yellow, the heads 2 or 3 lines broad; bractlets membranaceous, oblong, acute, not exceeding the heads; fruit prickly, 2½ lines long, stipitate. —Coastal S. Cal.

4. **S. bipínnatífida** Dougl. PURPLE SANICLE. Fig. 678. Plants ½ to 1 ft. high, the herbage disposed to be purplish; taproot deep-seated, its thickened multicipital crown bearing a cluster of leaves and several stems which are leafy mainly or wholly toward the base; leaves 2½ to 4 in. long, mostly triangular in outline, pinnately 3 to 7-parted, the divisions distant, decurrent on the rachis as a toothed wing, and cut into oblong or ovate unequally toothed or serrate lobes; flowers purple, the sterile pediceled, borne in dense heads 2½ to 4 lines in diameter; umbels irregular, with long or short rays, small leaf-like bracts and small lanceolate bractlets; fruit covered all over with bristles.—Grassy slopes in the hills: coastal S. Cal.; Coast Ranges; Sierra Nevada foothills; n. to B. C. May-June. Var. FLÀVA Jepson. Leaves mostly light green with broad primary division (¾ to 1½ in. wide); flowers yellow.—Butte Co.; Plumas Co. Var. NEMORÀLIS Jepson. Winged rachis entire or sparsely denticulate; flowers yellow.—Sierra Nevada from Mariposa Co. to Nevada Co.

678. Sanicula bipinnatifida Dougl.; *a*, typical leaf x ½; *b*, early leaf x 3; *c*, infl. x ½; *d*, fr. x 3; *e*, sect. carp. x 6.

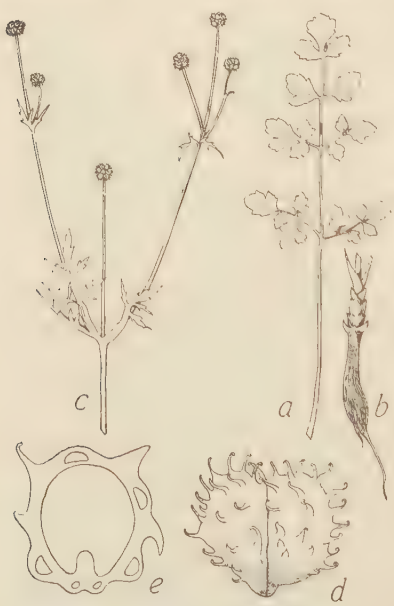
5. **S. marítima** Kell. DOBIE SANICLE. Plants 10 to 12 in. high, the stout stem from a much-thickened root; basal leaves rather numerous, elliptical to orbicular, entire or slightly serrate, 1 to 2 in. long, on petioles 4 to 6 in. long; cauline leaves few, 3-parted into obovate or roundish divisions (as are sometimes the basal leaves), with sub-entire or coarsely toothed margins; peduncles few, elongated; umbel with 1 to 4 rays 1 to 2½ in. long; involucre of leaf-like bracts; involucel of many small lanceolate bractlets; flowers yellow, the sterile ones short-pediceled; fruit bristly, somewhat naked below, 1½ lines long; seed-face concave with a very prominent median longitudinal ridge.—Local species of low and wet adobe lands in the vicinity of salt-marshes bordering San Francisco Bay.

6. **S. láciniàta** H. & A. Coast Sanicle. Plants 6 to 13 in. high; stem from a medium taproot, the branches few and disposed to diverge; leaves mainly basal, roundish in outline, ½ to 1 in. long, palmately 3-cleft or parted, the divisions incisely lobed or laciniate with spreading teeth, their petioles 1 to 2 in. long; upper leaves and foliaceous involucres similar but reduced; umbel with 2 to 5 unequal rays (⅓ to 1½ in. long) or 1 or 2 of the rays again umbellate; flowers yellow, subtended by an involucel of oblong-ovate or lanceolate bractlets 1 line long; sterile flowers long-pediceled; fruit prickly, somewhat naked below, 1½ lines long.—Slopes of the coast hills from Humboldt Co. to Monterey Co. Apr. Var. serpentìna Jepson. Leaves 1 to 1½ in. long, palmately 3-parted, or divided, the lobes pinnately parted into often remote lanceolate segments, these entire or laciniately toothed.—Monterey Co. to Marin Co.

7. **S. nevadénsis** Wats. Sierra Sanicle. Low plants, with several spreading peduncles 1 to 6 (or 9) in. long arising basally or from the very short stem; leaves about 1 in. long, on petioles as long or twice as long, ternate, the divisions with distinct petiolules, oblong-ovate to roundish in outline, 3 to 5-lobed with the segments again lobed or toothed; rays 3 to 10 in an umbel, 1 line to 1 in. long, the bracts pinnatifid, leaf-like; bractlets small, oblong, acute, more or less united; flowers yellow, the sterile on pedicels 1 to 1½ lines long; fruit tuberculate, the tubercles ending in hooked bristles.—Middle altitudes in the mountains, 5000 to 6000 ft.: San Bernardino Mts. and n. through the Sierra Nevada to Modoc and Siskiyou Cos. May-June. Var. glaúca Jepson. Leaves glaucous, very finely divided.—Rocky slopes. Tulare and Kern Cos.

8. **S. septéntrionàlis** Greene. Plants erect, 6 to 12 in. high; peduncles few, divaricately spreading, scattered along the stem; leaves 1 to 2 in. long; fruit 2 lines long; otherwise like no. 7.—Montane, 5000 to 7000 ft.: Sierra Nevada (Tulare Co. to Siskiyou Co.); high North Coast Ranges; n. to B. C.

9. **S. bipinnàta** H. & A. Poison Sanicle. Fig. 679. Stem from an elongated tuber-like root, erect, usually simple below, ⅔ to 2 ft. high; herbage with a strongly aromatic odor; leaves chiefly basal, 2 to 4 in. long, twice or thrice pinnate, the ultimate divisions obovate or oblong, 3 to 4 lines long, not decurrent; umbel with 3 or 4 rays and leaf-like bracts; flowers yellow, the heads 2 lines in diameter and subtended by several small more or less united bractlets; fruit tuberculate, the tubercles tipped with stout hooked bristles.—Shady woods in the low hills, Coast Ranges and Sierra Nevada. Apr.



679. Sanicula bipinnata H. & A.: *a*, leaf x ½; *b*, root x ½; *c*, fr. branchlet x ½; *d*, fr. x 4; *e*, sect. carp. x 7.

10. **S. tuberòsa** Torr. Turkey Pea. Fig. 680. Stem from a globose tuber, 5 to 9 (or 14) in. high, simple or divided at or near the surface of the ground into 2 to 5 long peduncle-like often divergent branches, each irregularly di- or tri-chotomous, the divisions ending in 1 to 4-rayed umbels and commonly with pedicellate heads in the forks; leaves once or twice ternate, then pinnatifid, usually very finely dissected into acutish segments; involucres of leaf-like bracts; involucels of small ovate or lanceolate partially united bractlets; heads 2 to 3 lines broad; flowers yellow, the sterile on pedicels 1 to 2½ lines long; fruit flattened laterally,

tuberculate but not at all bristly, 1 line long.—Rocky or gravelly slopes in the foothills, 500 to 2500 ft. and up to 5000 ft.: Coast Ranges; Sierra Nevada; s. to San Diego Co. and L. Cal.

11. **S. saxátilis** Greene. Stems several, branching and widely spreading from the base, 4 to 7 in. long; root a very thick and fleshy tuber, more or less elongated or irregular; ultimate leaf segments broad, coarsely toothed; flowering branches repeatedly dichotomous; flowers straw color; upper tubercles on the fruit tipped with a reduced subulate and somewhat hooked bristle; otherwise like no. 10. — Rocky crests, Mt. Diablo.

680. Sanicula tuberosa Torr.; *a*, habit x ½; *b*, fr. x 7; *c*, sect. carp. x 10.

3. ANTHRÍSCUS Bernh.

Annual herb. Leaves bipinnate with bipinnatifid leaflets, the upper leaves reduced. Flowers white. Umbels compound, lateral, shortly peduncled or sessile. Rays few. Involucre none. Involucel of few lanceolate bractlets. Fruit somewhat laterally compressed, ovate, shortly beaked, curved with short hooked bristles. Ribs and oil-tubes none or obscure. (Greek anthriscus, its etymology unknown.)

681. Scandix pecten-veneris L.; *a*, fr. branchlet x ½; *b*, fr. x ¾; *c*, carpel x ¾; *d*, sect. carp. x 10.

1. **A. vulgàris** (L.) Pers. BUR CHERVIL. Slender, 1½ to 3 ft. high; rays 3 to 6, ½ to 1 in. long; pedicels 1 to 3 lines long; fruit 1¾ lines long. — Adventive European weed.

4. SCÁNDIX L.

Annuals with dissected decompound leaves. Flowers white, polygamous, in compound umbels. Staminate flowers with stamens and green disk, and occasionally with short styles; pistillate flowers with long styles, purple disk and with or without stamens. Rays commonly 2, rarely 1 or 3. Involucre none or of one bract. Involucels of several bractlets. Petals unequal, the outer larger. Fruit linear, flattened laterally, muriculate, prolonged into a beak several times longer than the body. Ribs prominent. Oil-tubes none or obscure. Seed-face sulcate. (The Greek name.)

1. **S. pecten-véneris** L. SHEPHERD'S NEEDLE. Fig. 681. Erect, simple or branching, 5 to 16 in. high, somewhat hispidulous; leaves 2 or 3 times pinnately dissected into linear acute segments less than ½

line wide; bractlets 2 or 3- toothed at apex or entire; rays ½ to 1 in. long; pedicels very short; body of fruit 4 lines long, bearing a straight flattish beak 1¾ in. long, its edges hispidulous.—San Francisco Bay region; nat. from Eur.

5. **OSMORRHÌZA** Raf. Sweet Cicely

Perennials with thick aromatic roots. Leaves mostly basal, 2 to 3 times ternately compound. Flowers white, in compound umbels. Calyx teeth obsolete. Involucre reduced or obsolete. Involucels present or none. Fruit linear or linear-oblong, rather prominently attenuate at base, glabrous and smooth or bristly along the ribs; carpels pentagonal in cross section, with equal ribs. Oil-tubes none in mature fruit. Seed-face concave to very deeply sulcate. (Greek osme, odor, and rhiza, root.)

Fruit with bristly ribs; carpel long-attenuate at base (except no. 1).
  Involucels of several bractlets.....1. *O. brachypoda.*
  Involucels none.
    Fruit beaked or constricted at apex.....2. *O. nuda.*
    Fruit obtuse at apex.....3. *O. obtusa.*
Fruit ribs not bristly; carpel not attenuate (mostly obtuse) at base.
  Fruiting rays usually erect, forming a compact cluster of fruits; leaflets oblong-lanceolate.....4. *O. occidentalis.*
  Fruiting rays spreading, forming a loose umbel; leaflets ovate.....5. *O. bolanderi.*

1. **O. brachypoda** Torr. Erect, 1½ to 1¾ ft. high, glabrous or strigosely puberulent; leaflets coarsely laciniate-cleft and serrate, mucronulate, ¾ to 2 in. long; umbel 1 to 5-rayed, the fruiting rays 2 to 4 in. long; pedicels 1 line long; involucre mostly absent; involucels of linear acuminate bractlets; fruit 7 to 9 lines long, the ribs armed with bristles pointed upward; seed-face deeply concave or even involute.—Sierra Nevada, 3000 to 5000 ft., from Sierra Co. to Tulare Co.; South Coast Ranges from Santa Clara Co. to Santa Barbara Co.; cismontane S. Cal.

2. **O. nùda** Torr. Fig. 682. Stem glabrous, 1½ to 2½ ft. high or less; leaves 5 to 11 in. long, the cauline much reduced; petioles with short stiff spreading hairs, the leaflets more or less hispidulous; leaflets ovate or elliptical, 3-lobed or -cleft and serrate, often narrowly or broadly cuneate at the entire base, ½ to 2½ in. long; rays 3 or 4 (to 6), 2 to 4 in. long; pedicels 3 to 8 lines long; involucels none; fruit 5 to 8 lines long, attenuate into a slender base ¼ to ½ as long as the body, and at apex more or less contracted into a beak ½ to 1 line long; attenuate base of fruit very bristly, the body upwardly bristly on the ribs; seed-face sulcate.—Shady woods: cismontane S. Cal.; Coast Ranges mostly near the coast, 100 to 2000 ft.; Sierra Nevada, 4000 to 6000 ft., from Tulare Co. to Placer Co. The most common species of this genus. Var. BRÉVIPES Jepson. Leaflets puberulent or strigose; pedicels 1½ to 3 lines long.—Tuolumne Co. to Siskiyou Co. Var. DIVARICÀTA Jepson. Nearly glabrous, but variable in this respect and scarcely of varietal rank.—Placer Co. to Tehama Co. and n.

682. Osmorrhiza nuda Torr.; *a*, leaf x ⅓; *b*, umbel x ⅓; *c*, fr. x 2½; *d*, sect. carp. x 18.

3. **O. obtùsa** Fer. Resembles no. 2, but more slender, 1 to 1½ ft. high; herbage almost glabrous; rays

widely spreading or the lateral deflexed; fruiting pedicels 2 to 4, divaricate, 6 to 8 lines long; fruit 5 to 7½ lines long, obtuse or slightly pointed at the tip, less bristly.—Sierra Co.; e. to Rocky Mts.; n. to B. C.

4. **O. occidentàlis** Torr. Sierra Sweet Cicely. Plants 2 to 3½ ft. high; herbage minutely puberulent or nearly glabrous; leaflets oblong-lanceolate (or rarely ovate), serrate or sparingly incised, 1 to 1½ (or 2½) in. long, some of them obliquely lobed on one side by a deep incision toward the base; rays 5 to 12, in fruit erect (1 to 2¼ in. long) and forming a close or compact umbel; pedicels 1½ to 4 lines long; bracts 1 or 2 or none; stylopodium conical, about equaling the style; fruit 6 to 7 lines long, acutish at apex or obscurely short-beaked, with prominent acute not bristly ribs; seed-face very concave.—Sierra Nevada, 4000 to 8500 ft., from Madera Co. to Siskiyou Co., thence s. to Mendocino Co.; n. to Alb.

5. **O. bolánderi** (Gray) Jepson. Stems stout, 3 ft. high; herbage more or less puberulent, somewhat more pubescent at the nodes; leaflets broadly ovate, coarsely toothed, 1 to 2 in. long; fruiting rays spreading, 1½ to 3 in. long; fruit 8 to 9½ lines long, with a stout short beak; stylopodium flat, shorter than the style; seed-face deeply sulcate.—Mendocino Co. to Siskiyou Co.

6. DAÚCUS L.

Bristly or hispid annuals or biennials with dissected decompound leaves and white flowers. Umbels compound, concave, surrounded by cleft bracts and borne on long peduncles. Involucels of entire or toothed bractlets. Calyx-teeth obsolete. Fruit somewhat flattened dorsally. Primary ribs slender, bristly; secondary ribs with a single row of prominent barbed prickles. Oil-tubes as in Caucalis. (Daukos, the Greek name.)

Involucre divided into short linear or lanceolate segments; rays mostly 2 to 6 lines long... 1. *D. pusillus.*

Involucre divided into elongated filiform segments; rays 1 to 2½ in. long....2. *D. carota.*

1. **D. pusíllus** Michx. Rattlesnake Weed. Annual, 4 to 7 (or 22) in. high; stems and peduncles retrorsely hispid; leaves finely dissected into linear segments; rays mostly 2 to 6 lines long, sometimes as much as 1 or 1½ in. long, somewhat unequal; pedicels very unequal, commonly 1 or 2 lines long or almost wanting; fruit 1½ to 2 lines long.—Throughout cismontane Cal. in the hill country; n. to B. C., e. to the Carolinas. Apr. The herbage is in rural repute as an antidote for the bite of the rattlesnake, whence "Yerba del Vibora" of the Spanish-Californians.

2. **D. caròta** L. Carrot. Biennial; stems erect, branching, hispid, 2 to 3 ft. high; root fleshy, conical; leaves many times dissected into small linear or lanceolate segments; segments of the involucre linear-lanceolate or subulate; rays numerous, 1 to 2 in. long in fruit; umbels in fruit concave and like a bird's nest; fruit 2 lines long.—European cultivated plant, an escape from gardens, locally naturalized in valley lands.

7. TÓRILIS L.

Erect slender annuals with hispidulose herbage, bipinnate leaves and white flowers in subcapitate umbels. Involucre and involucels of linear bracts. Fruit with the secondary ribs more prominent than the primary and bearing a row of bristles or tubercles; bristles rough, hooked at tip. Oil-tubes solitary, 2 on the commissure. (Derivation unknown.)

1. **T. nodòsa** (L.) Gaertn. Knotted Hedge Parsley. Erect, 7 to 13 in. high, the stems with few branches, retrorsely scabrous; leaves pinnate (lower 3 to 5 in. long including petiole, the upper successively shorter); leaflets bipinnately dissected; umbels scattered along the stems opposite the leaves, on very short peduncles (1 or 2 lines long), simple or with a supplementary short proliferous umbel; fruits 1½ to 2 lines long, those on the outside of the umbel with the exterior carpel densely covered with hooked bristles, the inner carpels as well as the inner fruits warty and without prickles.—Nat. from Eur., now widely spread and locally common on openly wooded hills.

683. Caucalis microcarpa H. & A.; *a*, leaf x ½; *b*, umbel x ½; *c*, fr. x 6; *d*, sect. carp. x 7.

8. CAÚCALIS L.

Annuals with decompound leaves dissected into small segments. Flowers white. Umbels more or less irregularly compound. Calyx-teeth prominent. Fruit flattened laterally. Primary ribs 5, filiform, bristly; secondary ribs 4, prominent, winged, bearing barbed or hooked prickles. Oil-tubes solitary in the intervals, i. e., under the secondary ribs, 2 on the face. (Kaukalis, the Greek name.)

1. **C. microcárpa** H. & A. Fig. 683. Erect, slender, 6 to 12 in. high; leaves 2 or 3 times ternate and much dissected, slightly hispid; umbels unequally 3 to 5-rayed; rays 1 to 3¾ in. long; pedicels 8 lines long or less; involucre of foliaceous dissected bracts; involucels of entire or somewhat divided bractlets; fruit oblong, 2 lines long, armed with rows of hooked prickles. — Coast Ranges, Sierra Nevada, coastal S. Cal., widely distributed but not common; s. to Mex., e. to Ariz., n. to Wash.

9. APIÁSTRUM Nutt.

Small branching glabrous annual with dissected leaves. Flowers small, white, in irregularly compound umbels. Rays and pedicels unequal. Involucre and involucels none. Calyx-teeth wanting. Fruit somewhat laterally compressed, elliptic-cordate, more or less tuberculate. Oil-tubes solitary in the intervals, 2 on the commissure. Seed-face narrowly concave. (Apium, celery, and aster, Latin suffix meaning wild.)

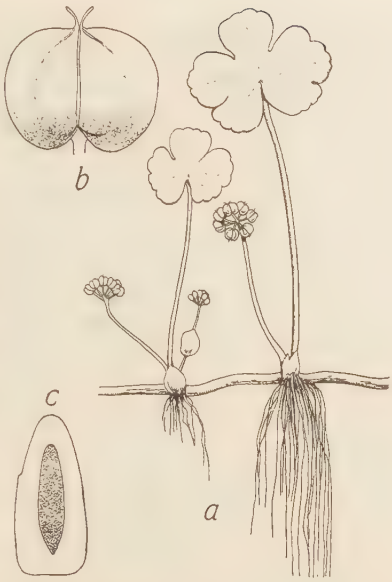
1. **A. angustifòlium** Nutt. Fig. 684. Erect, di- or tri-chotomously branched from the base, 4 to 8 (or 15) in. high; leaves opposite below, twice or thrice ternately dissected into linear segments ½ to 1 in. long; umbels sessile in the forks or opposite the upper leaves, consisting of 2 or 3 umbellets borne on unequal rays (1 in. long or less), and of 1 or 2 usually sessile or sometimes pediceled flowers in the center; umbellets 3 or 4-flowered, the pedicels unequal (4½ lines long or less) or 1 flower sessile; fruit cordate, broader than high, less than 1 line long, papillate-roughened all over; ribs inconspicuous. —Dry mountain slopes or sandy valleys: Coast Ranges; Sierra Nevada; cismontane S. Cal.; L. Cal. Apr.-May.

684. Apiastrum angustifolium Nutt.; *a*, umbels x 1; *b*, fr. x 10; *c*, sect. carp. x 10.

10. **HYDROCÓTYLE** L.

Perennial glabrous herbs, the peduncles and leaves from creeping stems or rootstocks. Leaves simple, round in outline, long-petioled. Flowers in a small simple umbel, or disposed in 2 or more umbels which are proliferous one above the other. Fruit flattened laterally, suborbicular, the dorsal rib prominently margined and with one or 2 filiform ribs on each side. Oil-tubes none. (Greek hudor, water, and cotule, a low vessel, the peltate leaves of some species being saucer-shaped.)

Leaves not peltate, 5 or 6-cleft; umbels simple.....1. *H. ranunculoides.*
Leaves peltate, more or less crenate.
Umbels simple, fruit notched at base and apex...2. *H. umbellata.*
Umbels proliferous, forming an interrupted spike.
Fruit not notched at base, sessile or on very short pedicels 3. *H. verticillata.*
Fruit notched at base, the pedicels 1½ to 7 lines long.... 4. *H. prolifera.*



685. Hydrocotyle ranunculoides L. f.; *a*, habit x ½; *b*, fr. x 6; *c*, sect. carp. x 12.

1. **H. ranúnculoìdes** L. f. WATER PENNYWORT. Fig. 685. Stems floating or creeping in mud, rooting at the nodes; leaves orbicular, (¾ or) 1 to 1¾ in. broad, 5 or 6-cleft, the lobes crenulate; petioles 3 to 5 (or 9) in. long; peduncles ½ to 2½ in. long, reflexed in fruit; pedicels ½ line long; fruit ovoid, 1 line broad; ribs obscure.—Pools or muddy shores, often floating in rather deep water: South Coast Ranges to S. Cal.; thence e. to the Atlantic.

2. **H. umbellàta** L. Petioles and peduncles subequal, 1½ to 4 (or 6) in. high, arising from slender creeping rootstocks with descending branches bearing round tubers; leaves orbicular-peltate, crenate, 4 to 7 (or 14) lines broad; umbels many-flowered, simple (rarely slightly proliferous); bracts of involucre short, ovate; pedicels 1¾ to 6 lines long; fruit ¾ to 1 line long, strongly notched at base and apex; dorsal rib prominent but obtuse.—S. Cal.; s. to Mex., e. to the Atlantic.

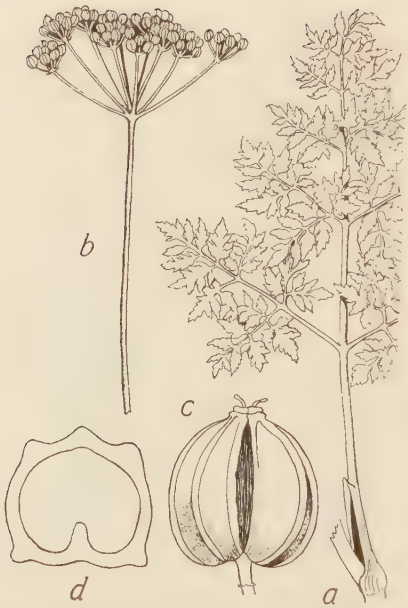
3. **H. vérticillàta** Thunb. Similar in habit to no. 2; umbels forming an interrupted spike of 3 to 5 whorls; fruit shortly pediceled or sessile.—Sw. Colorado Desert; e. to the Atlantic. Var. CUNEÀTA Jepson. Fruits abruptly short-acute at base—Great Valley to S. Cal.

4. **H. prolífera** Kell. MARSH PENNYWORT. Peduncles and petioles subequal, 6 to 12 in. high; descending branches of the rootstock tuberous-enlarged; leaves orbicular-peltate, emarginate at base, slightly crenate, 1¼ to 1¾ in. broad; umbels proliferous, one above the other in 2 to 4 whorls; pedicels 1½ to 7 lines long; mature fruit 1 line long and slightly broader, slightly notched at base and apex.—Marshes of the lower Sacramento and San Joaquin rivers, thence w. to San Francisco and Sonoma Cos.

11. **BÒWLESIA** R. & P.

Delicate annuals with stellate pubescence, opposite simple leaves and scarious lacerate stipules. Umbels simple, few-flowered, on short axillary peduncles. Flowers white, minute. Calyx-teeth prominent. Fruit ovate, somewhat flattened laterally, with narrow commissure; carpels turgid, becoming depressed on the back. Ribs and oil-tubes none. (Wm. Bowles, 1705-1780, Irish naturalist and traveler.)

1. **B. lobàta** R. & P. Stems mostly branching at the base, weak and trailing, ½ to 2 ft. long, flowering from the base; leaves thin, mostly 5-lobed,



686. Conium maculatum L.; *a*, leaf x ¼; *b*, umbel x ½; *c*, fr. x 6; *d*, sect. carp. x 10.

broader than long, usually heart-shaped at base, the lobes entire or some of them 1 or 2-toothed, ½ to 1 in. broad; petioles 1 to 3 in. long or the upper shorter; umbels 1 to 4-flowered; fruit 1 line long.—Shaded places in the hills: Coast Ranges; Sierra Nevada; S. Cal.; e. to Tex.

12. CONÌUM L.

Tall branching biennial with dissected decompound leaves. Flowers white, in compound umbels. Involucre and involucels small. Calyx-teeth obsolete. Fruit broadly ovate, somewhat laterally flattened. Ribs prominent. Oil-tubes none. (Greek name of the Hemlock.)

1. **C. maculàtum** L. Poison Hemlock. Fig. 686. Tall (4 to 10 ft. high), the stem dotted with purple marks; herbage with a mouse-like odor; leaves 1 to 2 ft. long or more, the segments incised or pinnatifid; rays 10 to 16, ¾ to 1¼ in. long; bractlets ovate-lanceolate, commonly 3; fruit 1½ lines long, shorter than the pedicels.—Native of Eur., naturalized in shady or moist ground. Widely distributed. A poisonous plant, all parts toxic, although preparations from the leaves are sometimes inert.

13. CORIÀNDRUM L.

Slender glabrous strong-smelling annual with leafy stems. Lower leaves pinnate or bipinnate with broad leaflets; upper leaves finely dissected. Flowers white or rose-tinted, the petals conspicuously unequal. Umbels compound. Involucre none. Involucels of few narrow bractlets. Fruit subglobose, not constricted at the commissure; calyx-teeth conspicuous; ribs filiform or acutish; oil-tubes solitary in the intervals, a few on the commissure. (Ancient Latin name.)

1. **C. satìvum** L. Coriander. One to 2½ ft. high; leaflets of lower leaves roundish or ovate, cleft and toothed, ½ to 1¼ in. long; divisions of upper leaves linear, 2 to 4 lines long; fruit 1¾ lines long.—Garden plant from s. Eur., occasionally escaped from cultivation.

14. ÀPIUM L.

Ours erect glabrous biennials with fibrous roots and pinnate leaves. Stems tri- or di-chotomously branched, forming a paniculate inflorescence, the compound umbels opposite the leaves, terminal on the branches or subsessile in the forks. Involucre and involucels small or none, or the former sometimes foliaceous. Flowers white. Calyx-teeth obsolete. Fruit elliptic-ovate or broader than long. Ribs prominent, obtuse, equal. Oil-tubes solitary in the intervals, 2 on the commissure. Seed-face plane. (Old Latin name of Celery.)

1. **A. gravèolens** L. Common Celery. Stems 2 to 4 ft. high; lower leaves long-petioled, the leaflets 5 (or 7 or 9), 1 to 3 in. long and as broad or broader, coarsely toothed and 3-cleft or even 3-divided; upper leaves on short petioles or sessile, the leaflets 3; rays 4 to 12 lines long; fruit ¼ to ½ line long.—Garden plant from Eur., nat. in marshes or along streams, Sacramento Valley to S. Cal. July-Aug.

15. ÁMMI L.

Erect branching glabrous biennial with slightly fusiform roots and dissected decompound leaves. Flowers white, in compound umbels. Bracts parted into filiform segments, reflexed. Bractlets lanceolate, acuminate, spreading or reflexed. Calyx-teeth obsolete. Fruit ovoid, very slightly flattened laterally. Ribs filiform. Oil-tubes solitary in the intervals and 2 on the commissure. (Greek name of an umbelliferous plant.)

Leaf segments spatulate, serrate or laciniate; fruiting rays spreading.....1. *A. majus.*
Leaf segments filiform or narrowly linear, entire; fruiting rays closely contracted.....
2. *A. visnaga.*

1. **A. màjus** L. Bishop's Weed. Stem slender, branching above, 1¼ to 2½ ft. high; basal and lower leaves simply pinnate with 7 or 5 (or 3) obovate to oblong serrate leaflets ¾ to 3 in. long; upper leaves biternate or ternate-pinnate, the divisions narrowly oblanceolate, acute, laciniate or serrulate, especially at apex, about ½ to 2 in. long; rays about 25 to 30, little unequal, ¾ to 2 in. long; pedicels 1 to 1½ lines long; bracts linear below, parted above into 3 filiform divisions; bractlets lanceolate, acuminate, entire, scarious-margined at base; fruit less than 1 line long; carpels with concave face; oil-tubes solitary in the intervals, 2 on the commissure.—European weed, naturalized in Napa Valley; low places.

2. **A. visnága** Lam. Stouter, ⅓ to 2¾ ft. high; leaves tri-ternately dissected into filiform segments 3 to 6 lines long; fruiting umbels and umbellets contracted; fruit about 1 line long.—European plant, naturalized in the Santa Clara Valley.

16. CÀRUM L.

Ours erect and slender glabrous biennials or perennials. Leaves simply pinnate with few linear entire leaflets. Flowers white, in compound umbels. Involucre of entire bracts or none. Involucels of entire bractlets. Calyx-teeth small. Stylopodium conical. Fruit ovate or oblong, somewhat laterally compressed, with filiform or salient ribs. Oil-tubes solitary in the intervals, 2 to 6 on the commissure. (Karon, Greek name of the Caraway.)

Leaflets linear; involucre none or of 1 or 2 small linear-setaceous bracts; ribs filiform.
Stems clustered, arising from a fascicle of coarse roots; involucre inconspicuous, of 1 or 2 small bracts or none; styles short.....1. *C. kelloggii.*
Stems solitary, arising from a tuber or cluster of tubers; styles long.
Fruit about 1 line long; Sierra Nevada and coastal; common.2. *C. gairdneri.*
Fruit 1½ to 2 lines long; Siskiyou Co.; rare.....
3. *C. oreganum.*
Leaflets ovate to oblong; stem solitary, from a tuber or a cluster of tubers; bracts of the involucre about 12 to 15, lanceolate, at length reflexed; ribs salient..4. *C. howellii.*

1. **C. kellóggii** Gray. Fig. 687. Stems several from a fascicle of coarse and hard fibrous roots, 3 to 5 ft. high; basal leaves 5 to 10 in. long, ternate, each division pinnate with narrowly linear divisions 3 to 4 in. long; cauline leaves similar but smaller; involucral bracts and involucel bractlets several, lanceolate or subulate; rays ¾ to 1½ in. long; stylopodium very large, with short stout styles; carpels frequently unequal or only one maturing.—Dry

687. Carum kelloggii Gray; *a*, leaf x ⅓; *b*, root x ⅓; *c*, umbel x ⅓; *d*, fr. x 2½; *e*, sect. carp. x 7.

688. Carum gairdneri Gray; *a*, leaf x ½; *b*, root x ½; *c*, umbel x ½; *d*, fr. x 8; *e*, sect. carp. x 16.

open foothills, 100 to 500 ft.: Coast Ranges (Santa Clara Co. to Humboldt Co.); Sierra Nevada foothills (Tuolumne Co. to Butte Co.)

2. **C. gáirdneri** Gray. SQUAW-ROOT. Fig. 688. Stem solitary, 1 to 3⅓ ft. high, from a tuberous root or a fascicle of such; leaves few, simply pinnate, the leaflets 3 to 7 (or 9), linear, 2 to 4 in. long; upper leaves mostly simple; flowering rays 3 to 6 lines long, in fruit about twice as long; involucre of 1 or 2 linear acute bracts or none; involucels of few linear acuminate bractlets; fruit broadly oblong to elliptic or ovatish, 1 to 1½ (or 2) lines long; stylopodium low, with long slender styles. —Adobe flats or meadows or hills: Coast Ranges from Monterey Co. to Siskiyou Co.; Sierra Nevada from Tulare Co. to Butte Co., gregarious and often whitening moist meadows at 3000 to 7000 ft.

3. **C. oregànum** Wats. Resembling no. 2; leaves more divided with shorter leaflets; fruit 1½ to 2 lines long; seed sulcate beneath the oil-tubes.—Siskiyou Co.; n. to B. C.

4. **C. howéllii** C. & R. Fig. 689. Stem stoutish, 2½ to 4½ ft. high, arising from a heavy cluster of very stout very fibrous fusiform roots; leaves bipinnate, mostly lanceolate in outline; leaflets crowded, broadly oblong to ovate, acute, coarsely but sparingly serrate or sparingly incised, ¾ to 1¾ in. long; rays 16 to 40, ¾ to 2¾ in. long in fruit; pedicels 2 to 5 lines long; bracts several, narrowly lanceolate, reflexed, 8 to 12 lines long; bractlets similar, mostly reflexed, nearly as long as the pedicels, scarious-margined; fruit 2 lines long; ribs thick-based, acute.—Moist mountain meadows, 2000 to 3600 ft.: Mariposa Co. to Nevada Co.; Mendocino Co. to Siskiyou Co.; n. to Ore. Rare.

689. Carum howellii C. & R.; *a*, leaf x ⅓; *b*, umbel x ⅓; *c*, fr. x 3; *d*, sect. carp. x 8.

17. **EÙLOPHUS** Nutt.

Glabrous erect perennials with deep-seated fascicled tubers, the leaves all basal or the cauline few and small. Leaves compound with the terminal segments or leaflets often differing markedly from the lateral ones; lateral leaflets linear and entire, rarely ovate or oblong and incised; terminal leaflets elongated, always entire and often caudate. Flowers white or pinkish. Umbels compound, long-peduncled. Bracts of involucre and bractlets of

involucel similar, several, lanceolate to obovate, acuminate. Calyx-teeth prominent. Fruit ovate to linear-oblong, flattened laterally. Ribs filiform, equal. Stylopodium conical, with long strongly recurved or deflexed styles. Oil-tubes 1 to 5 in the intervals, 2 to 8 on the commissure. Seed-face broadly concave, with a central longitudinal ridge. (Greek eu, true, and lophus, crest, in reference to the salient terminal leaflet.)

Terminal leaflet commonly much longer than the lateral ones.
Rachis of the leaves not dilated.
Oil-tubes solitary in the intervals; fruit 3 to 4 lines long.....1. *E. californicus.*
Oil-tubes more than one in the intervals (as also in nos. 3 to 5); fruit 2 lines long.....2. *E. bolanderi.*
Rachis of the leaves dilated, the segments few and mostly short.....3. *E. pringlei.*
Terminal leaflet similar to the lateral ones; leaflets 1 to 3 in. long.
Bractlets narrowly lanceolate.....4. *E. parishii.*
Bractlets ovate, cuspidate.....5. *E. cuspidatus.*

1. **E. californicus** (Torr.) C. & R. Fig. 690. Stems generally 1 to 3, 3 to 5 ft. high; leaves basal, twice or thrice ternate, then pinnate or pinnately divided, the segments or leaflets ovate, 3 to 7 lines long, incised or serrate, the terminal leaflets linear-elongated, entire, ½ to 2 in. long; fruiting rays 1 to 2¾ in. long; fruit linear-oblong, 3 to 4 lines long; oil-tubes large, solitary in the intervals, sometimes an extra one in one of the intervals, 2 to 4 on commissure.—Along streams, Sierra Nevada foothills from Stanislaus Co. to Mariposa Co.; Mt. Hamilton Range. Var. SANCTÒRUM Jepson. Lateral segments narrower, disposed to be unilaterally or unequally lobed. —S. Monterey Co.

690. Eulophus californicus C. & R.; *a*, leaf x ⅜; *b*, umbel x ⅜; *c*, fr. x 5; *d*, sect. carp. x 9.

2. **E. bolánderi** (Gray) C. & R. Plants 1 to 2 ft. high; tubers 1 to 8, obfusiform or oblong; herbage glabrous; leaves once, twice or thrice ternate, the ultimate lateral ones linear, the divisions 2 to 12 lines long, the ultimate central division 1 to 3 in. long; fruiting rays 4 to 10 lines long; pedicels 1½ to 2 lines long; bracts few, lanceolate, scarious, or none; bractlets several, narrowly to ovate-lanceolate, abruptly acuminate, scarious, rather shorter or sometimes longer than the pedicels; fruit oblong, 2 lines long; oil-tubes minute, 2 to 5 in the intervals, 6 on the commissure.—Sierra Nevada and Yollo Bolly Mts., 6000 to 9000 ft.; n. to Ida.

3. **E. pringlei** C. & R. Stem 1 to 1½ ft. high; leaves pinnately compound with broad inflated midrib, the primary divisions once or twice pinnately divided into few linear-filiform or linear-subulate segments 1 to 6 lines long, the terminal segment 2 to 10 lines long; rays 5 to 10, ½ to 1½ in. long; pedicels 1 to 2 lines long; involucre of 1 or 2 very small bracts; involucels of several subscarious lanceolate bractlets 1 to 2 lines long; fruit oblong, 2 to 2½ lines long; oil-tubes 3 to 5 in the intervals, 8 on the commissure.—Inner South Coast Ranges from San Luis Obispo Co. to n. Los Angeles Co.

4. **E. parishii** C. & R. Stem usually very slender, ⅔ to 1¼ (or 2½) ft. high; tubers 1 to 3, fusiform; leaves ternate, sometimes biternate; leaflets narrowly linear to narrowly lanceolate, 1 to 3 or 4½ in. long, the terminal sometimes distant; uppermost leaves simple, bract-like; rays 5 to 22, 4 to 7 or 11 lines long in fruit; pedicels 1 to 2 lines long; involucre none or scanty; bractlets 2 to 6, narrowly lanceolate, 2 lines long; fruit oblong to ovate

1 to 1½ lines long; oil-tubes 2 to 5 in the intervals, 6 on the commissure.—Bogs and meadows, 6000 to 8000 ft.: mts. of S. Cal. (not uncommon); Sierra Nevada from Tulare Co. to Nevada Co. (rare).

5. **E. cuspidàtus** Jepson. Stem slender, 6 to 9 in. high, sparingly branched; leaves bipinnately divided into few linear divisions; rays 6 to 10, 2 to 5 lines long; pedicels 1 to 2 lines long; bracts 4 to 6, obovate, membraneous, erosulate at the truncatish or obtuse apex, 2 lines long, tipped by a bristle 1 to 1½ lines long; fruit (immature) ovate, obscurely short-beaked, 1½ lines long.—Calaveras Co.

18. CICÙTA L. Water Hemlock

Tall branching glabrous perennials growing in marshes or by stream banks. Rootstocks short and erect, or horizontal and branching. Leaves at least partially twice or thrice pinnate. Flowers white, in compound umbels. Involucre present or none. Involucels of small bractlets. Calyx-teeth somewhat prominent. Styles somewhat short. Fruit flattened laterally, broadly ovate to roundish. Ribs corky, broad but low, the lateral in cross section larger than the intermediate and dorsal. Oil-tubes 2 on the commissure, solitary in the intervals. (Classical name of the Hemlock, which was given to criminals, and sometimes, when the Greeks had a superfluity, to philosophers, as a death-poison.)

Fruit with the intervals red-brown, contrasting with the corky ribs; intervals broad.
  Plants of living streams.
    Leaves simply pinnate or partially bipinnate below.....1. *C. californica.*
    Leaves bi- to tri-pinnate.....2. *C. douglasii.*
  Plants of salt-marshes.....3. *C. bolanderi.*
Fruit with intervals of much the same color as the ribs; intervals very narrow.....
4. *C. vagans.*

1. **C. californica** Gray. California Water Hemlock. Stems about 3 ft. high; basal leaves pinnate or partly bipinnate below, 1 to 2½ ft. long, on long (½ to 1½ ft.) petioles; leaflets ovate-lanceolate or lanceolate, serrate, 3 to 5 in. long, often deeply 1-lobed on one side towards the base so as to make a supplementary leaflet; rays somewhat unequal, 1¼ to 2½ in. long; pedicels 2 to 4 lines long; involucre none, or merely 1 narrow bract; bractlets several, ovate, acuminate; fruit 1 to 1¼ lines long with narrow not depressed oil-tubes, those on the face approximate near the median line; ribs large and corky, rounded, yellowish, the intervals very narrow or lineate, dark red-brown. — Coast region from Mendocino and Lake Cos. to Monterey Co.

691. Cicuta douglasii C. & R.; *a*, leaf x ⅛; *b*, umbel x ¼; *c*, fr. x 5; *d*, sect. carp. x 10.

2. **C. douglásii** (DC.) C. & R. Western Water Hemlock. Fig. 691. Stems stout, glaucous, 3 to 4 ft. high; herbage often purplish; rootstocks short; leaves bipinnate; leaflets sessile or nearly so, lanceolate, 1½ to 4 in. long, coarsely incised-serrate to serrulate, sometimes falcate; involucre none or of a few lanceolate bracts; involucels consisting of 9 to 12 lanceolate-acuminate bractlets; rays 1½ to 2½ in. long; pedicels 2 lines long; fruit sub-orbicular, 1 to 2 lines long; ribs very broad and low; intervals narrow, red-brown, sharply defined from the light-colored ribs; oil-tubes small; seed not channeled under the oil-tubes. — Mountain streams, almost throughout Cal.; n. to Alas.

3. **C. bolánderi** Wats. Stem 5 to 10 ft. high, branched above, with nearly or quite vertical rootstock and large basal and cauline bipinnate leaves ¾ to 2 ft. long; leaflets lanceolate, serrate, 1¼ to 3 in. long; bracts and bractlets lanceolate, the former often scarious-margined; rays 1 to 1½ in. long, subequal, pedicels 2 lines long; fruit 1½ to 2 lines long, prominently ribbed, the carpels when quite mature rather strongly concave on the commissure, thus appearing somewhat lunate; oil-tubes broad, depressed in the channeled seed.—Marshes about Suisun Bay.

4. **C. vàgans** Greene. Habit and appearance of no. 2; corky ribs low and broad, brownish, the intervals of the same color and not revealing the oil-tubes.—E. side of the northern Sierra Nevada in Nevada Co.; n. to Ida.

692. Oenanthe sarmentosa Presl; *a*, leaf x ½; *b*, umbel x ½; *c*, fr. x 4; *d*, sect. carp. x 8.

19. OENÁNTHE L.

Aquatic glabrous herbs with succulent stems from thick rootstocks. Leaves pinnately compound. Flowers white, in compound umbels terminating the branches. Involucre present or none. Involucels present. Calyx-teeth rather prominent. Styles slender, at length elongated. Fruit in ours cylindric, slightly flattened laterally. Ribs broad, obtuse, corky; commissural face also corky. Oil-tubes solitary in the intervals, 2 on the commissure, the seed furrowed beneath them. (Ancient Greek name of some thorny plant.)

693. Berula erecta Cov.; *a*, leaf x ⅜; *b*, fl. branchlet x ½; *c*, fr. x 12; *d*, sect. carp. x 15.

1. **O. sarmentòsa** Presl. Fig. 692. Stems 2 to 4 ft. high; leaves bipinnate, or the lowest ones elongated-pinnate (1 to 2 ft. long), or partially bipinnate towards the base; leaflets ovate, serrate, coarsely toothed or incised, ¾ to 1½ (or 2½) in. long; rays ¾ to 1 in. long; bracts few or none; bractlets lanceolate, acuminate; fruit 1 to 2 lines long, the ribs very corky and somewhat turgid.—Slow streams or shallow ponds, often filling them with dense masses: S. Cal.; Coast Ranges; n. Sierra Nevada; n. to B. C.

20. BÉRULA Hoffm.

Glabrous aquatic or marsh perennial. Leaves simply pinnate, the leaflets sharply and often somewhat saliently serrate. Involucre and involucels present, the bracts and bractlets narrow. Flowers white, in compound umbels. Calyx-teeth minute. Fruit

roundish, flattened laterally, obscurely notched at base. Carpels with very slender and inconspicuous ribs and thick corky pericarp. Oil-tubes numerous, contiguous, surrounding the seed. (Latin name of the Water Cress.)

1. **B. erécta** (Huds.) Cov. Fig. 693. Erect, corymbosely branching, ½ to 2 ft. high; leaflets 3 to 9 pairs, ovate to oblong, 1 to 2½ in. long; fruiting rays ½ to 1 in. long; pedicels 1½ to 2 lines long; fruit ¾ line long.—Swamps and streams, coastal S. Cal.; n. through the deserts to Inyo Co. and along e. side of Sierra Nevada to Siskiyou Co.; N. Am., Eur., Asia.

21. SÌUM L. Water Parsnip

Glabrous perennial marsh or aquatic herbs with leafy stems. Leaves simply pinnate. Flowers white, in compound umbels. Bracts and bractlets several to many. Calyx-teeth minute. Styles short. Stylopodium depressed. Fruit ovate or oblong, somewhat laterally compressed, with narrow commissure. Ribs corky, prominent or somewhat salient, with broad red-brown intervals. Oil-tubes 1 to 3 in the intervals, always 2 or 3 in at least one of the intervals, 2 to 6 on the commissure. (Sion, Greek name of some water plant.)

694. Sium cicutaefolium Gmel.: *a*, leaf x ⅛; *b*, umbels x ½; *c*, fr. x 6; *d*, sect. carp. x 12.

1. **S. cicùtaefòlium** Gmel. Fig. 694. Stem stout, 2½ to 3½ ft. high, from a cluster of fleshy-fibrous roots; leaves ½ to 3½ ft. long; leaflets 5 to 13, lanceolate, serrate, 2 to 4 in. long; bracts and bractlets ovate to lanceolate, the bracts reflexed, scarious-margined below; fruit ovoid, 1½ lines long, with acute ribs.—Sloughs and ponds from Siskiyou Co. to Lassen and Modoc Cos.; n. to B. C., e. to Va. Var. HÉTEROPHÝLLUM Jepson. Lowest leaves simple, on long fistulous petioles, or few-pinnate. — Marshes in the Great Valley: Suisun Marshes; Stockton.

22. ÒROGENÌA Wats.

Dwarf glabrous perennial herbs with fleshy roots. Stem very short, mostly underground, sheathed by large scarious bracts. Leaves basal, ternate or biternate, with linear segments. Involucre none. Involucels of few linear bractlets. Flowers white, in partly compound umbels, the rays very unequal. Fruit oblong, only slightly flattened laterally. Carpels flattened dorsally; dorsal and intermediate ribs filiform; lateral ribs strongly corky thickened, extended towards the companion carpel so as to leave a large central cavity which is divided longitudinally by a thick corky ridge from the middle of each face. Oil-tubes small, 3 in the intervals, 2 to 4 on the commissure. (Greek oros, mountain, and genos, race, referring to the habitat.)

1. **O. fusifórmis** Wats. Plants 3 to 4 in. high, arising from a long fusiform root; leaf segments ½ to 1½ in. long; umbels 2 to 10-rayed; fruit about 3 lines long.—Wet sandy soil, n. Sierra Nevada from Nevada Co. to Plumas Co.; n. to Ore.

23. LIGÚSTICUM L. Lovage

Perennial herbs with large aromatic roots. Herbage glabrous. Leaves bi- or tri-ternate in ours, with pinnate divisions. Flowers white or pinkish, in

many-rayed compound umbels. Involucre none. Involucels of narrow bractlets. Calyx-teeth small or obsolete. Fruit oblong or ovate, a little flattened laterally. Ribs prominent, acute or slightly winged, equal. Oil-tubes mostly 3 to 5 in the broad intervals, 6 to 10 on the commissure. (Name derived from Liguria, a province of Italy, where Lovage, Ligusticum levisticum L., is endemic.)

Stem more or less leafy; rays and leaf-margins scabrous; coastal..... 1. *L. apiodorum.*

Stem not leafy or with 1 reduced leaf; rays and leaf-margins not scabrous; montane.....2. *L. grayi.*

1. **L. àpiodòrum** (Gray.) C. & R. Fig. 695. Stems more or less leafy, 2 to 3 (or 6) ft. high; rays and the margins of the leaflets and commonly the peduncles and the nerves of the leaflets scabrous; leaves uni-, bi- or partly tri-ternate, then the divisions pinnate with 3 or 5 leaflets; leaflets broadly ovate in outline, laciniately pinnatifid, ½ to 2 in. long; fruiting rays ¾ to 1 (or 1½) in. long; bractlets linear-setaceous, few or none; fruit broadly oblong, 1½ to 2 lines long, the ribs very sharp; oil-tubes

695. Ligusticum apiodorum C. & R.; *a*, leaf x ½; *b*, fr. umbel x ½; *c*, fr. x 5; *d*, sect. carp. x 10.

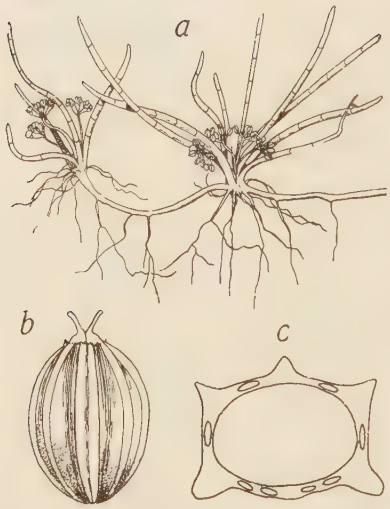
4 or 5 in the dorsal intervals, 5 or 6 in the lateral ones, 6 to 8 on the commissure.—Rocky or brushy hills, San Francisco to Humboldt Co. June.

696. Ligusticum grayi C. & R.; *a*, leaf x ⅜; *b*, umbels x ½; *c*, fr. x 5; *d*, sect. carp. x 9.

2. **L. gràyi** C. & R. Fig. 696. Plants 1 to 2½ ft. high, glabrous, the stems 1 or 2 from a stout fibrous-coated caudex, not leafy or with one much reduced leaf; leaves basal, once or twice ternate, then pinnate with 5 or 7 leaflets, the leaflets ovate in outline, incised, parted or divided, ½ to 1¼ in. long; flowers white; bractlets linear-setaceous, few or none; fruiting rays 1 to 2½ in. long; pedicels 2 to 3 lines long; fruits 2 lines long, the ribs very narrowly winged; oil-tubes 3 to 6 in the intervals, 4 to 8 on the commissure.—Montane, 4000 to 10,200 ft.: Sierra Nevada (Tulare Co. to Modoc Co.); inner North Coast Range (Mendocino Co. to Siskiyou Co.).

24. LILAEÓPSIS Greene

Small glabrous perennials. Stems fistulous, creeping and rooting in the mud, only the leaves and short peduncles erect. Leaves reduced to hollow cylindrical petioles jointed



697. Lilaeopsis lineata var. occidentalis Jepson; *a*, habit x ½; *b*, fr. x 12; *c*, sect. carp. x 18.

by transverse partitions. Flowers dull white or slightly tinged with pinkish brown, in a few-flowered simple umbel. Bracts of the involucre minute. Fruit subglobose. Dorsal ribs filiform, the lateral corky and thickened next to the commissure. Oil-tubes solitary rarely 2) in the intervals, 2, 4 or 6 on the commissure. (Named for its resemblance to Lilaea.)

1. **L. lineàta** (Michx.) Greene var. **occidentàlis** Jepson. Fig. 697. Leaves 1 to 8 in. long, 1 to 2 lines wide; peduncles 1 in. long or less; fruiting pedicels 1½ to 3 lines long; petals plane; fruit 1 line long. — Salt marshes or brackish mud flats along the coast from Marin Co. to Humboldt Co.; n. to Alas.

25. **PODÍSTERA** Wats.

Dwarf perennial, the stems short and shortly branched, forming a mat-like plant. Leaves once or twice pinnately parted. Umbels compound but very much condensed. Involucre none. Involucels of 3 to 5-cleft green bractlets. Flowers white or pinkish. Calyx-teeth prominent. Styles ribbon-like. Fruit flattened laterally, elliptic-ovate. Ribs slender. Oil-tubes 2 or 3 in the intervals, 6 on the commissure. (Greek podos, foot, and stereos, solid, referring to the compactly involved pedicels and involucels.)

Leaves pinnately parted.....1. *P. nevadensis.*
Leaves bipinnately parted.....2. *P. albensis.*

1. **P. nevadénsis** (Gray) Wats. Peduncles arising from the short crowded branches, ¾ to 1½ in. high; herbage obscurely puberulent; leaves pinnately parted, 4 to 9 lines long, the 5 to 7 segments narrowly oblong, acute, entire, 1 to 3 lines long, the petioles with membranous sheaths; flowers yellow; umbels very much condensed; fruit 1 to 1¼ lines long.— Alpine, 11,600 to 13,000 ft., on high peaks of the Sierra Nevada in Tuolumne and Mono Cos.

2. **P. albénsis** Jepson. Similar to no. 1; plants 1 to 2¼ in. high; leaves bipinnatifid, the oblong segments 1 to 2 lines long.—Rocks, White Mts., Inyo Co., 7000 to 8000 ft.

26. **OREONÀNA** Jepson

Low tufted grayish plants, the peduncles and leaves from the root-crown of a stout taproot. Herbage woolly or roughish pubescent. Leaves ternately compound and finely dissected, the segments crowded, callous-margined and cuspidate. Flowers white, in compound umbels, the umbels much condensed or capitate. Rays

698. Oreonana clementis Jepson; *a*, habit x ½; *b*, umbellet x 2½; *c*, fr. x 4; *d*, sect. carp. x 12.

about 10 to 15. Calyx-teeth present, often conspicuous. Involucre none. Involucels unilateral. Fruit broadly elliptic or orbicular, somewhat laterally compressed, sessile. Ribs filiform. Sterile flowers on filament-like pedicels which are longer than the rays. Oil-tubes 3 to 5 in the intervals, 3 or 4 or 6 on the commissure. (Greek oreos, mountain, and nannos, dwarf, these plants very small as compared with the Velaeas from which they are separated.)

Rays membranously winged and web-footed; sterile pedicels equaling or little exceeding the fruit; calyx-teeth of sterile flowers very conspicuous, star-like. . . . . 1. *O. clementis.*

Rays not winged; sterile pedicels greatly exceeding the fruit; calyx-teeth inconspicuous. . . 2. *O. vestita.*

1. **O. cleméntis** Jepson n. comb. Fig. 698. Plants 1 to 3 in. high; peduncles ascending, from the scaly winter-buds of the root-crown; blades, pedicels and fruits with a short stiff spreading pubescence, the plant otherwise glabrous; peduncles equaling or little exceeding the leaves; umbel globose-capitate; involucels 5-lobed, the lobes ovate-acuminate; rays membranously winged and web-footed at base, very short (1 to 2 lines long); fruit densely white-pubescent when young, grayish in age, sessile, globose, the calyx-teeth evident; pedicels of sterile flowers equaling or only slightly exceeding the fruit; oil-tubes 3 to 5 in the intervals, 4 (or 3) on the commissure; calyx-teeth of sterile flowers very conspicuous, star-like.—Upper Kern River basin, 6000 to 12,000 ft. (Drudeophytum clementis Jones.)

2. **O. vestìta** Jepson. Plants 2 to 4 in. high, clothed with a dense soft-silky pubescence; umbels condensed but still umbellate in form, equaling or mostly raised above the leaves; involucels of lanceolate 3 to 5-lobed bractlets; rays 6 to 10 lines long, not winged; sterile pedicels 4 to 6 lines long, greatly exceeding the fruit; fruit sessile or nearly so, ovate-oblong, soft-pubescent, 2 lines long; oil-tubes 3 or 4 in the intervals, 3 on the commissure; calyx-teeth of sterile flowers evident but not conspicuous.—San Gabriel and San Bernardino mountains, 6500 to 10,000 ft., rare. (Deweya vestita Wats.)

27. **VELAÈA** DC.

Subglabrous perennials with thick yellow elongated odorous taproots. Leaves mostly basal, pinnately or ternately compound. Ours usually without involucre, the involucels in our species of few small lanceolate bracts. Flowers yellow, in compound umbels. Fruit oblong or orbicular, somewhat laterally compressed, with acute or filiform equal ribs. Oil-tubes conspicuous, 3 to 6 in the intervals, 4 to 10 on the commissure. Seed-face strongly involute, inclosing a central cavity. (Sebastin Eugene Vela, student of the Umbelliferae.)

Leaves simply pinnate; ribs of carpel prominent.—Subgenus DEWEYA. . . . . 1. *V. arguta.*

Leaves ternate; ribs of carpel filiform, slender or inconspicuous. — Subgenus DRUDEOPHYTUM.

Ultimate leaf segments 1 to 2 in. long; bractlets conspicuous, often exceeding the umbellet; fruit 3 to 4 lines long. . . . . 2. *V. hartwegii.*

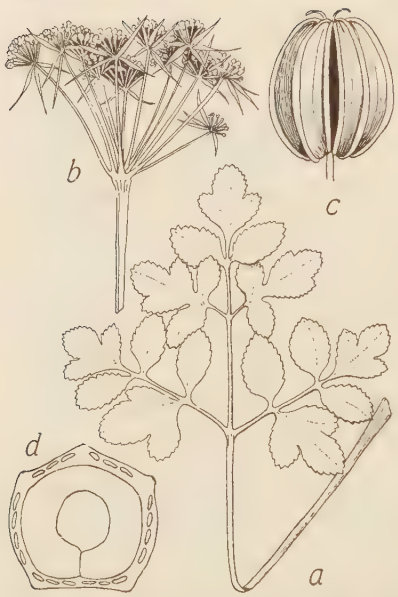
Ultimate leaf segments usually less than 1 in. long; bractlets inconspicuous, shorter than the umbellets.

Calyx teeth obsolete; fruit nearly orbicular, 1 to 2 lines long, as broad or nearly as broad. 3. *V. kelloggii.*

Calyx teeth evident; fruit oblong, 2 to 3 lines long. . . . . 4. *V. parishii.*

699. Velaea arguta C. & R.; *a*, leaf x ½; *b*, umbel x ½; *c*, fr. x 3; *d*, sect. carp. x 8.

1. **V. argùta** (Nutt.) C. & R. Fig. 699. Plants 1 to 2½ ft. high, the



700. Velaea hartwegii C. & R.; *a*, leaf x ⅓; *b*, umbel x ½; *c*, fr. x 3; *d*, sect. carp. x 6.

leaves simply pinnate, 2 to 5 in. long, on petioles about 1½ times as long; leaflets 5 to 7, ovate, finely and sharply serrate, 1 to 2 in. long, the lowest often petiolulate; terminal and lowest leaflets often subcordate and often 3-lobed; rays 12 to 20, 1½ to 3 (or 5) in. long; pedicels 1 to 4 lines long; involucre mostly none; involucels of few linear acuminate bractlets; fruit oblong, 4 lines long; ribs acute, prominent; oil-tubes 3 to 5 in the intervals, 4 to 6 on the commissure.—Montane: coastal S. Cal.; L. Cal.

2. **V. hartwégii** (Gray) C. & R. Fig. 700. Plants mostly tufted, 1 to 3 ft. high, the peduncles and leaves from a shortly branched caudex; peduncles and petioles somewhat scabrous; leaves biternate, or partly triternate, the ultimate lateral divisions mostly 3-foliolate, the ultimate middle divisions mostly 5 or 7-foliolate; leaflets ovate or oblong, sparingly incised, serrate, mucronate, ¾ to 2 in. long, or the leaflets often more or less confluent; petioles 2 to 6 in. long; rays about 15, 2 to 4 in. long in fruit; bracts none; bractlets 3 to 6, unequal, linear-lanceolate, long-pointed, exteriorly disposed, mostly surpassing the umbellets; fruit nearly orbicular, 3 to 4 lines long; ribs slender but rather prominent; oil-tubes 3 (or 4 to 6) in dorsal intervals, 3 or 4 (to 6) in laterals, 6 (in sets of 3) or 9 on the commissure.—Foothills: Sierra Nevada, 2000 to 5000 ft. from Tulare Co. to Butte Co.; South Coast Ranges from Ventura Co. to Contra Costa Co., mostly 1000 to 2000 ft. Apr. Widely distributed but somewhat rare locally.

3. **V. kellóggii** (Gray) C. & R. Plants erect, ¾ to 2⅔ ft. high; flowering stems leafless or with a single leaf only; leaves basal, 1 to 2 or 3 times ternate; leaflets ovate or roundish, sharply serrate and more or less incised or lobed, mostly ½ to 1 in. long; fruiting rays 2 to 4 in. long, or in fruit 3 to 4 in. long; pedicels 2 to 4 lines long; fruit nearly orbicular, 1 to 2 lines long, nearly as broad as long or a little broader, somewhat notched at base; ribs filiform; oil-tubes 3 in the dorsal intervals, 5 to 6 in the laterals, 8 to 10 on the commissure.—Cañons in the foothills: Coast Ranges from Humboldt Co. to Contra Costa Co., 500 to 1500 ft.; n. Sierra Nevada foothills from Sacramento Co. to Butte Co., 1000 to 3500 ft.; rather rare.

4. **V. parishii** C. & R. Plants erect, short (½ to 1½ ft. high), with mostly basal leaves; herbage glabrous throughout; leaves ½ to ⅓ as long as flowering stems, thickish, bipinnate, the segments ovate, irregularly incised or cuspidate-toothed, 4 to 7 lines long; rays 14 to 20, 1 to 2¼ in. long; pedicels 2 to 3 lines long; pedicels of sterile flowers often equaling the fruit; involucre none; involucels of a few setaceous bractlets; calyx-teeth prominent; fruit oblong, 2 to 3 lines long; oil-tubes 3 or 4 in the intervals, 4 or 5 on the commissure.—Mts. of S. Cal. and n. to the Sierra Nevada of Kern and Tulare Cos., 4000 to 8000 ft.

28. FOENÍCULUM Hill.

Stout glabrous perennial with dark green aromatic herbage. Leaves decompound, dissected into numerous filiform segments. Flowers yellow, in large compound umbels. Involucre and involucels none. Calyx-teeth obsolete. Fruit oblong, the ribs prominent. Oil-tubes solitary in the intervals, 2 on the

commissure. (Diminutive of Latin foenum, hay, from its odor.)

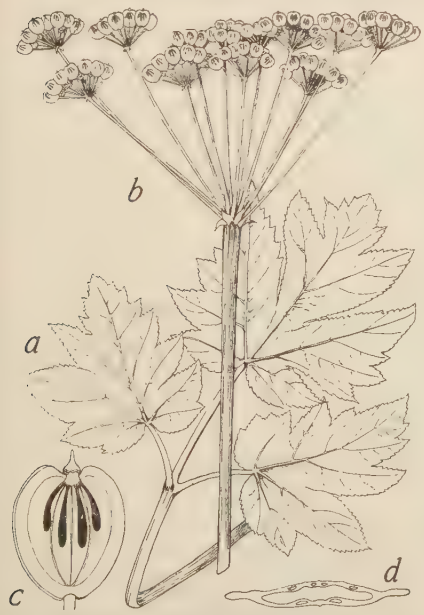
1. **F. vulgàre** (L.) Gaertn. SWEET FENNEL. Fig. 701. Stem striate, branching, 3 to 7 ft. high; herbage glaucous; rays ½ to 2½ in. long; fruit 1½ to 2 lines long. — Nat. from Eur., frequenting waste places on old farms and by country lanes; flowering in summer.

701. Foeniculum vulgare Gaertn.; *a*, leaf x ¼; *b*, umbel x ¼; *c*, fr. x 5; *d*, sect. carp. x 10.

29. **HERACLÈUM** L.

Tall perennials with stout stems from thick horizontal rootstocks. Leaves very large, ternately compound, with broad sheathing petioles. Flowers white, in a large many-rayed compound umbel. Involucre deciduous. Involucels of numerous bractlets. Petals obcordate, the marginal ones of the umbel much larger. Fruit almost round, strongly compressed. Lateral ribs with a thin wing; dorsal and intermediate ribs filiform. Oil-tubes 2 on the commissure, 1 in each interval, visible from the outside and reaching from the summit to about the middle of the carpels. (Named for Hercules, who, it is said, first used it in medicine.)

1. **H. lanàtum** Michx. COW PARSNIP. Fig. 702. Plants 4 to 5 ft. high; leaflets 3, petiolulate, ovate or orbicular, sharply serrate and lobed, 3 to 6 in. broad; umbels 6 to 10 in. broad; fruit 3½ to 5 lines long. —Common in brushy cañons or on north slopes: high mts. of S. Cal.; Coast Ranges near the sea; middle altitudes in the Sierra Nevada; n. to Alas., e. to the Atlantic. Reputed poisonous to cattle.



702. Heracleum lanatum Michx.; *a*, leaf x ⅛; *b*, umbel x ¼; *c*, carp. x 2; *d*, sect. carp. x 3.

30. **LEPTOTAÈNIA** Nutt.

Tall stoutish perennials, with thick fusiform roots and ternately or pinnately compound leaves. Flowers yellow or purple, in compound umbels. Involucre of few bracts or none. Involucels of several small bractlets or none. Fruit oblong to suborbicular, strongly compressed. Lateral ribs with broad corky-thickened wings coherent until maturity. Dorsal and intermediate ribs filiform and approximate. Oil-tubes 1 to 8 in the intervals, 2 to 10 on the commissure or obscure and apparently none. (Greek leptos, narrow, and tainia, vittae or oil-tubes.)

Stems leafy below; leaves large, the ultimate segments short.
Leaves glabrous; oil-tubes present.....1. *L. californica.*
Leaf margins and veins puberulent beneath; oil-tubes none.....2. *L. dissecta.*
Peduncles and leaves from the root-crown; leaves smaller, glabrous, the segments linear, elongated or grass-like.
Bracts obovate; wings thicker than the body of the fruit.....3. *L. anomala.*
Bracts lanceolate, entire; wings not so thick as the body of the fruit....4. *L. humilis.*

1. **L. californica** Nutt. Fig. 703. Erect, 2 to 4 ft. high, glabrous, glaucous; leaves once or twice ternate, then pinnate; leaflets 1 to 2 in. long or more, cuneate-orbicular or -obovate, 3-lobed or the terminal 3-parted, serrate above; peduncles at summit abruptly widened into a disk-like dilation; rays subequal, 2 to 3 in. long; bracts none; fruiting pedicels 3 to 9 lines long; bractlets few or none; fruit elliptical, narrowly winged, 4 to 6 lines long; oil-tubes 6 to 10 on the commissure (the lateral frequently anastomosing), 3 or 4 in the intervals or sometimes obscure.—Coast Ranges, 500 to 3000 ft., n. to Siskiyou Co. and southern Ore., s. to Santa Barbara and Kern Cos.

703. Leptotaenia californica Nutt.; *a*, leaf x ¼; *b*, umbel x ¼; *c*, fr. x 1½; *d*, cross sect. of carp. x 3.

2. **L. dissécta** Nutt. Plants 1½ to 2¾ ft. high, leafy at base; leaves broad, 2 or 3 times ternate and then once or twice pinnate, the segments incised-pinnatifid; ultimate segments linear-oblong, 1 to 2 lines long; peduncles 1 to 2 ft. long; fruiting rays 2 to 4½ in. long; involucre of few bracts or none; involucels of several lanceolate bractlets; flowers yellow or purplish; fruit oblong, 5 to 9 lines long, sessile or on pedicels 1 line (rarely to 3 lines) long; dorsal and intermediate ribs filiform or sometimes obscure; oil-tubes none or very obscure.—Open wooded slopes: Coast Ranges from Mendocino Co. to Siskiyou Co., thence s. in the Sierra Nevada to Mariposa Co.; n. to B. C. Apr.-June. Var. MULTÍFIDA Jepson. Leaves dissected into linear segments 2 to 4 lines long; fruiting pedicels 3 to 7 lines long; fruit 5 to 7½ lines long; seed face concave.—Montane, 3500 to 8000 ft.: Sierra Nevada from Nevada Co. to Kern Co.; s. to S. Cal.; e. to N. Mex., n. to Mont.

3. **L. anómala** C. & R. Plants 10 to 12 in. high, glabrous throughout; leaves all basal, ternate, then pinnate, the divisions few, distant, very narrowly linear, ½ to 3 in. long; peduncles arising from the root-crown, slender, 6 to 8 in. high; rays 3 to 6, unequal, 1¼ to 3 in. long in fruit; pedicels about 1 line long, the umbellets in fruit forming a compact cluster; involucre none; involucels conspicuous, the bractlets prominent, obovate, scarious-margined, veiny, toothed near the apex, more or less united; fruit elliptic to oblong, 3 to 4 lines long, the lateral ribs corky-thickened (**much thicker than** the body), the others filiform; oil-tubes none or inconspicuous.—Sierra Nevada foothills in Amador Co. (Carbondale).

4. **L. húmilis** C. & R. Like no. 3; bractlets linear to lanceolate, entire; wings of the fruit corky-thickened but not as thick as the body.—Butte Co., plains near Little Chico Creek. This simulates Lomatium marginatum C. & R. Var. DENTICULÀTA Jepson. Wings of the fruit with denticulate margins; intervals commonly with about 3 longitudinal striae.—Blue Ravine, Eldorado Co.

31. **LOMÀTIUM** Raf. Hog-Fennel

Low perennials, mostly of dry ground, with thick roots. Stems usually several from the root-crown, naked or few-leaved. Leaves decompound, often dissected, wholly basal or sometimes partly sub-basal. Flowers white or yellow, rarely purple, in compound umbels. Involucre none (a few species sometimes with 1 to 3 bracts). Involucels usually present. Fruit roundish to broadly or narrowly oblong, much compressed. Lateral ribs winged, the wings of the companion carpels coherent until maturity. Stylopodium wanting or not obvious in the fruit. Oil-tubes 1 to 4 in the intervals, 2 to 6 on the commissure. (From Greek loma, a border, referring to the winged fruit.)

I. Stems from a taproot.

A. Peduncles not enlarged at summit.

a. Fruit notched more or less deeply at each end, so that the wings on each side the body are more or less distinct; leaves with the leaflets more or less broad in outline.—Subgenus Euryptera.

Leaves ternate, leaflets entire or merely toothed; coastal S. Cal. . . . . 1. *L. lucidum.*
Leaves bipinnate, the leaflets ovate in outline, but usually much incised; South Coast Ranges . . . . . 2. *L. parvifolium.*

b. Fruit not notched or scarcely so, the wings more or less joined above and below the body of the seed.

Leaves decompound, dissected into numerous very small segments.
Leaves ternate or quinate, broad or roundish in outline.—Subgenus Eulomatium.
Bractlets present.
Bractlets broad, roundish, or obovate; leaves ternate, then pinnately dissected; flowers yellow; widely distributed species.
Oil-tubes none in the intervals or indistinct; wings of fruit narrower than body, thickish . . . . . 3. *L. caruifolium.*
Oil-tubes solitary in the intervals; wings of fruit thin.
Wings broader than body; body situated mostly above middle of fruit . . . . . 4. *L. vaseyi.*
Wings equaling the body in breadth or narrower than body; body situated about middle of fruit . . . . . 5. *L. utriculatum.*
Bractlets narrow, most often lanceolate.
Bractlets not scarious-margined, often more or less united and unilateral.
Fruit glabrous; corolla glabrous; widely distributed species . . . . . 6. *L. macrocarpum.*
Fruit pubescent; corolla with kinky white hairs.
Pedicels mostly ½ in. or more long; wings of the fruit broad, membranous, thinly pubescent; Coast Ranges . . . . . 7. *L. dasycarpum.*
Pedicels mostly less than ½ in. long; wings of the fruit narrower, somewhat thickened, tomentose.
Fruit large (6 to 8½ lines long), elliptic, the wings about as broad as the body; body broadly ovate, densely tomentose; Great Valley and Sierra foothills . . . . . 8. *L. tomentosum.*
Fruit smaller (3 to 4½ lines long), broadly elliptic to orbicular, the wings narrower than the body; body oblong-elliptic, the intervals very dark and the ribs white-hairy; interior deserts and bounding ranges . . . . . 9. *L. mohavense.*
Bractlets scarious margined.
Herbage glabrous save the ciliolate leaf-margins . . 10. *L. ciliolatum.*
Herbage pubescent or puberulent; mostly summits and slopes towards the desert interior.
Flowers white or pale yellow.
Oil-tubes minute, 3 or more in the intervals; fruit ovate. 11. *L. nevadense.*
Oil-tubes broad, 1 to 3 in the intervals; fruit oblong or oblong-ovate . . . . . 12. *L. plummerae.*
Flowers purple; fruit elliptic; oil-tubes broad, 1 or 2 in the intervals . . . . . 13. *L. austinae.*
Bractlets none (rarely 1 or 2); fruit wings somewhat narrower than the body; petioles dilated into narrow sheaths their whole length; s. Sierra Nevada.
Leaves ternate-pinnate; flowers yellow; pedicels 1 to 2 lines long; oil-tubes solitary . . . . . 14. *L. torreyi.*
Leaves quinate-pinnate; flowers whitish; pedicels 3 to 4 lines long; oil-tubes indistinct . . . . . 15. *L. congdonii.*
Leaves pinnate, linear-lanceolate in outline; desert ranges.—Subgenus Cynomarathrum . . . . . 16. *L. parryi.*
Leaves with the divisions mostly few or at least not numerous, the leaflets narrow and much elongated.—Subgenus Lonchophyllum.
Fruit 3½ to 5½ lines long.

Leaflets many, ⅛ to ½ line broad; n. Sierra foothills.
Oil-tubes very minute, forming a continuous chain on the dorsal side; bractlets few.....17. *L. marginatum.*
Oil-tubes solitary in the intervals; bractlets none.....18. *L. alatum.*
Leaflets few, ½ to 1½ lines broad; oil-tubes very broad, solitary in the intervals; higher n. Sierra Nevada.....19. *L. triternatum.*
Fruit 9 lines long; Mendocino Co.....20. *L. gigantеum.*

B. PEDUNCLES ENLARGED AT SUMMIT.

Leaves with few divisions and broad leaflets; fruits very narrowly winged; bractlets none; flowers yellow; n. Cal.—Subgenus CRASSIPEDUNCULATUM.....21. *L. nudicaule.*

II. Stems from a globose tuber; leaflets elongated; bractlets present; oil-tubes solitary in the intervals.—Subgenus COUS.

Flowers yellow; fruit linear, the wings ¼ to ⅓ as wide as the body; Modoc Co.....22. *L. ambiguum.*
Flowers white; fruit elliptic, the wings ½ as broad as body; Sierra Co. to Siskiyou Co...23. *L. piperi.*

1. **L. lùcidum** (Nutt.) Jepson. Fig. 704. Plants ½ to 1½ ft. high, glabrous, the stout peduncles from very short basal stems; leaves with 3 leaflets or the lowest ones ternate, each division with 3 leaflets; leaflets roundish to ovate, mucronate-toothed, not lobed or often 3-lobed or -parted, ¾ to 1½ in. long; rays 10 to 15, 1 to 3 in. long; pedicels 3 to 6 lines long; involucels of lanceolate bractlets; flowers yellow; fruit nearly orbicular, emarginate at each end, glabrous, 4½ to 7½ lines long, with wings more than twice as broad as the narrowly oblong body, and prominent obtuse dorsal and intermediate ribs; oil-tubes solitary in the intervals, 2 to 4 on the commissure. —Coastal S. Cal. Var. REPÓSTUM Jepson. Leaves ternate, each division with 3 leaflets, or the central division with 9; leaflets ½ to ¾ in. long, finely toothed; body of carpel elliptic, the intervals often with secondary oil-tubes extending half the length.—Vaca Mts.

704. Lomatium lucidum Jepson: *a*, habit x ⅙; *b*, fr. x 1½; *c*, sect. fr. x 3.

2. **L. parvifòlium** (T. & G.) Jepson n. comb. Plants 7 to 12 (or 18) in. high, the peduncles arising from very short erect subterranean stems borne on the root-crown; leaves clustered near the base, bipinnate (but the upper leaflets confluent), 2 to 5 in. long; leaflets broad, irregularly incised and with broad strongly cuspidate teeth (3 or) 5 to 12 lines long; umbel 8 to 15-rayed, with involucels of linear or lanceolate acuminate bractlets; rays ¾ to 1¾ in. long; pedicels 2½ to 3½ lines long; flowers yellow; fruit broadly elliptical to orbicular, 2½ to 4 lines long, with wings broader than the body, and rather prominent dorsal and intermediate ribs; oil-tubes solitary in the intervals, 2 to 4 on the commissure.—Mountains, Santa Cruz Co. to San Luis Obispo Co. Var. PÁLLIDUM Jepson. Herbage very pale.—Santa Lucia Mts.

3. **L. cáruifòlium** (T. & G.) C. & R. ALKALI PARSNIP. Fig. 705. Peduncles 3 or 4, erect, 8 to 14 in. high, arising from the crown of a stout taproot; herbage glabrous or nearly so, or the foliage minutely pubescent; leaves ternately decompound, dissected into linear segments barely ½ line wide and 1 to 4½ lines long; bractlets distinct or nearly distinct, round-ovate to oblong, scarious-margined, entire or denticulate, usually acuminate, often shortly petiolate; fertile rays 6 to 11, 1 to 1½ in. long; pedicels in fruit 1¼

to 3 lines long; fruits glabrous, suborbicular or elliptic, 2½ to 4½ lines long, the wings ½ to almost as wide as the body; oil-tubes none on the commissure, none in the intervals or indistinct, but often with 2 or 3 obscure or superficial minor ridges.—Low wet ground: Sacramento and San Joaquin valleys, South Coast Ranges, Sierra Nevada foothills. Var. DÉNTICULÀTUM Jepson. Stout, 13 to 16 in. high; leaf-segments broader; rays unequal, the fertile 2½ to 5½ in. long; wing-margins roughened or denticulate. — Exeter, Tulare Co. Var. SOLANÉNSE Jepson. Rachises and leaf-segments scabridulous-puberulent.—Solano Co. plains.

705. Lomatium caruifolium C. & R.; *a*, leaf x ⅓; *b*, fr. umbel x ⅓; *c*, fr. x 3; *d*, sect. carp. x 5.

4. **L. vàseyi** C. & R. Peduncles ascending, 6 to 12 in. high, arising from the very short stems of the root-crown, naked or frequently with 1 or 2 leaves; foliage minutely puberulent, the plant otherwise mostly glabrous; leaves ternate-pinnate, the divisions pinnately cut into linear-oblong segments 1½ to 3 lines long and ½ to 1 line broad; petioles inflated, ½ to 1 in. long; rays 5 to 14, the fertile ½ to 2 in. long; pedicels 1 to 2 lines long; bractlets cuneate-obovate, laciniate-toothed at apex or abruptly acuminate; flowers yellow; fruit elliptic or slightly narrowed towards the base, 4 to 7 lines long, 3 to 4½ lines wide, the body situated mostly above the middle, only about 1 line wide and half as long as the fruit but contracted at base into a stipe-like process, and at apex into a beak-like process, the whole with broad wings broader than the body; dorsal and intermediate ribs obvious with broad solitary oil-tubes in the intervals, 4 on the commissure.—Dry mesas and mountain slopes, 1200 to 5500 ft.: San Diego Co.; San Bernardino Valley foothills; Inyo Co. ranges; Sierra Nevada from Tulare Co. n. to Siskiyou Co.; Napa Range.

5. **L. ùtriculàtum** (T. & G.) C. & R. Plants 8 to 12 in. high, the peduncles from short stems or from the root crown, usually glabrous except the minutely puberulent leaves; leaves ternate, then pinnately decompound and dissected into linear segments 1 to 3 lines long; petioles conspicuously inflated, membranaceous, 3 to 7 lines broad; umbellets in flower hemispherical or only a little more than a hemisphere; rays 3 to 15, very unequal, the fruiting ones ½ to 2 (or 3) in. long; fruiting pedicels 2 to 6 lines long; involucre none or occasionally with 1 often foliaceous bract; bractlets round-obovate to oblanceolate, entire, toothed or laciniate, usually acuminate, short-petiolate, equaling the yellow flowers; fruits narrowly elliptic, 2¼ to 4 (or 5½) lines long; wings as broad as or narrower than body; oil-tubes 4 to 6 on the commissure, 1 in each interval or with short accessory ones in the dorsal intervals.—Open grassy hills or plains, the most common species, frequent from S. Cal. n. through the Coast Ranges and Sierra Nevada foothills to Ore.

6. **L. macrocárpum** (Nutt.) C. & R. Plants 10 to 17 in. high, the peduncles several from a short scaly caudex; herbage thinly short-pubescent; leaves in a basal or sub-basal tuft, 2 to 5 in. long, or the earliest often as much as 1 ft. long, once or twice ternate, and twice pinnately divided, the segments linear, acute, ½ to 2½ lines long, the ultimate divisions of the rachis winged; fruiting rays about equal, ½ to 4 in. long; pedicels 2½ to 4½ lines

long; involucel of many lanceolate bractlets mostly exceeding the umbellets, sometimes united at base and unilateral; flowers dull white or pale yellow; corolla glabrous; ovary glabrous or nearly so; fruit oblong to ovate, mostly narrow, but sometimes very broad and somewhat quadrangular, 5½ to 8 (or 10) lines long, 2 to 3½ lines wide, the ribs inconspicuous or almost obsolete; oil-tubes 1 to each interval, 2 to 6 on the commissure, the seed sharply channeled beneath those of the dorsal intervals; wings broader, sometimes narrower than the body.—Open stony hills, 2000 to 5000 ft.: Coast Ranges and Sierra Nevada; n. to B. C. A common and widely distributed species. The farinaceous roots were used as food by the northern Indians. Var. DOUGLÁSII Jepson. Leaf-segments larger, as much as 4½ lines long and 1 line wide; umbel sometimes with a single bract.—Coast Ranges. Var. ELLÍPTICUM Jepson. Caudex bearing short leafy branches; leaf-segments oblong, cuspidate; fruit broadly elliptical, notched at base and apex, 9½ lines long and 4½ lines broad, the wings twice as wide as the body; dorsal and intermediate ribs obscure or filiform.—Feather River near Marysville; Pitt River.

706. Lomatium dasycarpum C. & R.; *a*, habit x ¼; *b*, pinna of leaf x ½; *c*, fr. x 1½; *d*, sect. fr. x 4.

7. **L. dasycárpum** (T. & G.) C. & R. Fig. 706. Plants 1 to 1½ ft. high, the peduncles arising from the root crown or from very short stems; herbage puberulent or pubescent, peduncles and wings of carpels often purplish; leaves ternately decompound and dissected into oblong or linear segments, these 1 to 2 or 3 lines long; umbels somewhat equally 6 to 15-rayed; rays 1 to 2 in. long; bractlets linear to ovate, more or less tomentose; pedicels in fruit about ½ in. long, usually longer than the carpels; flowers white; fruit purplish or whitish, broadly elliptic to orbicular, with subcordate base, 3½ to 4 (or 7) lines long, the wings thin membranaceous, 2 to 3 times the width of the very narrow or somewhat spindle-shaped body; body commonly very woolly when young, more or less glabrate in age; oil-tubes usually 1 in the intervals (often a second one in the lateral intervals), 2 to 4 on the commissure.—Hill slopes, 200 to 4000 ft., San Diego Co. to Contra Costa Co. Var. MÉDIUM Jepson. Bractlets mostly broadly ovate; body of carpel broader, nearly equaling the wings in breadth; oil-tubes most commonly 2 or 3 in the intervals.—North Coast Ranges. Var. DECÒRUM Jepson. Procumbent peduncles with white flowers; erect peduncles with lilac-purple flowers.—San Carlos Range.

8. **L. tomentòsum** (Benth.) C. & R. Plants 12 to 20 in. high, the peduncles arising from very short stems; herbage tomentulose; leaves ternately decompound into filiform segments; umbels 10 to 20-rayed, the rays 1½ to 2½ in. long; pedicels mostly shorter than the carpels; flowers white; bractlets ovate, acuminate; ovaries heavily clothed in white wool; fruit large, elliptic, 6 to 8½ lines long, usually densely tomentose, the wings little if at all wider than the broadly ovate body; oil-tubes usually 2 or 3 in the intervals, 2 or 4 on the commissure.—Great Valley and Sierra Nevada foothills.

9. **L. mohavénse** C. & R. Fig. 707. Low plants (7 to 10 in. high), the stout peduncles ascending from the root crown, not much exceeding the pinnately decompound leaves, the segments crowded, obovate or oblong, the

whole plant hoary with short pubescence; umbel somewhat unequally 6 to 12 (or more)-rayed; involucels inconspicuous, consisting of small linear-lanceolate acuminate bractlets; umbellets very numerous; fruit broadly elliptic to almost orbicular, 3 to 4½ lines long, the wings not as broad as the body; oil-tubes usually 3 or 4 (sometimes 2 or 5) in the intervals with 4 to 8 on the commissure.—Colorado and Mohave deserts and their bordering ranges, n. to Inyo Co., 4000 to 11,000 ft.

707. Lomatium mohavense C. & R.; *a*, habit x ¼; *b*, fr. x 2; *c*, sect. carp. x 5.

10. **L. cíliolàtum** Jepson. Peduncles and leaves from the crown of the tap-root; peduncles spreading, 1½ to 4 in. long; whole plant glabrous except the margins of the leaves which are finely and regularly ciliolate; leaves ovatish in outline, ¾ to 1¼ in. long, simply pinnate, the leaflets ¼ to ¾ in. long, irregularly pinnatifid into ovatish segments; rays 3 to 5, unequal, ¼ to 1¼ in. long; pedicels ½ to 1 line long; involucre none; involucels of several ovate bractlets with dark purple veins; fruit elliptic, 3½ to 4 lines long; lateral ribs with narrow wings (about ¼ line wide); dorsal and intermediate ribs filiform, inconspicuous, the dorsal and lateral intervals with 3 or 4 striae; oil-tubes obscure, 4 or 5 in the intervals, 2 on the commissure.—Yollo Bolly Mts.

11. **L. nevadénse** (Wats.) C. & R. Plants 4 to 7 in. high, the peduncles ascending from very short erect stems rising from the root-crown; herbage, rays and pedicels minutely pubescent; leaves decompound, the ultimate division pinnately divided into acute segments 1 to 2 lines long; umbel unequally 5 to 11-rayed, the rays ½ to 4 in. long; bractlets ovate to linear-lanceolate, scarious-margined, distinct or united at base; pedicels 1¾ to 4 lines long; flowers white with pubescent ovaries; fruit ovate, acute, minutely pubescent, 3 to 5 lines long, the wings narrower or almost as broad as the body; ribs on the back very fine or somewhat obscure, sometimes with supplementary striae in the intervals; oil-tubes 3 or 4 in the intervals, 4 to 6 on the commissure.—E. side of the Sierra Nevada from Mono Co. to Modoc Co.; se. Ore. to Nev. Var. PARÍSHII Jones. Ultimate leaf segments 2 to 4 lines long, or often elongated linear and up to 12 lines long; involucel unilateral, deeply toothed; pedicels ½ to 3 lines long; ovaries and fruit glabrous; fruit round-ovate to narrowly or broadly elliptic, 3½ to 5 lines long; wings usually narrower than the body; ribs filiform, often with 3 or 4 supplementary striae of the same size in the intervals; oil-tubes exceedingly small, several in the intervals.—Ranges in and bordering the Mohave Desert. Var. HOLÓPTERUM Jepson. Similar to the var. parishii; more finely puberulent; lateral wings of fruit broader (1 to 1¼ lines broad, commonly almost as broad as the body), straw-color; intermediate and dorsal ribs filiform but more evident; oil-tubes showing markedly from the outside.—E. Mohave Desert; e. to southern Nev.

12. **L. plúmmerae** C. & R. Plants 8 to 12 in. high, the peduncles stoutish, widely spreading, arising from very short stems; herbage glabrous and somewhat glaucous; leaves ternately decompound, the numerous crowded ultimate segments very small, oblong, more or less confluent; umbel very unequally 6 to 12 rayed, with involucels of numerous lanceolate acuminate

bractlets; rays ¼ to 1½ in. long; pedicels 1 to 4 lines long; flowers white; fruit oblong or oblong-ovate, usually acute at apex, glabrous, 3½ to 4 lines long, 1¾ to 2¼ lines broad, with wings half to as broad as the body, and indistinct dorsal and intermediate ribs; oil-tubes 1, 2 or 3 in the intervals, 4 to 6 on the commissure.—N. Sierra Nevada from Sierra Co. to Shasta Co. Var. SÓNNEI Jepson. Flowers yellow; oil-tubes 1 or 2 in the intervals.—E. Nevada Co.; thence to Washoe Co., Nev.

13. **L. áustinae** C. & R. Plants 9 in. high, the peduncles arising from short stems; herbage puberulent; ultimate leaf segments pinnately divided into narrow divisions; flowers purplish; fruit glabrous, 3 lines long, 1¼ lines broad; oil-tubes very broad, solitary in the dorsal intervals, mostly 2 in the lateral, 4 on the commissure.—Sierra Nevada from Plumas Co. to Siskiyou Co., 3000 to 5000 ft. Not well known.

14. **L. tórreyi** C. & R. Plants 3 to 10 in. high, the peduncles slender, arising from the root-crown and densely clothed at base with old leaf-sheaths; herbage glabrous; leaves small, ternate-pinnate or -bipinnate, the ultimate segments linear, cuspidulate, 1 to 3 lines long; umbel unequally few-rayed, the rays ½ to 1½ in. long; involucre none; bractlets none, or 1 or 2 and small; pedicels 1 to 2 lines long; flowers yellow; calyx-teeth small or obsolete; fruit narrowly oblong to linear, truncatish at base, 4 to 5 lines long, with wings not half as broad as the body; oil-tubes solitary in the intervals.—Clefts of granite rocks, Sierra Nevada from Mariposa Co. to Tulare Co., 6000 to 7200 ft.

15. **L. congdònii** C. & R. Plant 6 to 9 in. high, the peduncles ascending from the basal tuft of leaves; herbage glabrous; leaves first palmately quaternate or quinate (1 or 2 of the divisions small), then bi- or tri-pinnate, the rachises more or less scaberulous; ultimate segments linear, acute; sheaths whitish, narrow, extending the full length of the petiole; fertile rays 6 to 8, ¾ to 2 in. long; involucels none; flowers apparently white; pedicels spreading, 3 to 4 lines long; fruit nearly elliptical, slightly broader above, 4 to 4½ lines long, the wings slightly narrower than the body; dorsal and intermediate ribs filiform; oil-tubes very obscure, 1 or 2 (or perhaps more) in the intervals.—Mariposa Co., about 2000 ft.

16. **L. párryi** (Wats.) Jepson. Plants 6 to 10 in. high, the peduncles erect, arising from a caudex densely clothed with the fibrous sheaths of old leaves; herbage glabrous, foliage eventually grayish; leaves pinnate, linear-lanceolate in outline, 6 to 8 in. long, the pinnae distant, pinnately divided into linear cuspidate segments 1½ to 3 lines long; fruiting rays 1 to 1½ in. long, nearly equal; pedicels slender, 3 to 6 lines long; bractlets several, linear, acute, entire or cleft at apex, nearly equaling the pedicels in length; stylopodium more or less evident in fruit; fruit oblong, 6 lines long; dorsal and intermediate wings sharp, the lateral wings about as broad as the body; oil-tubes 1 or 2 in the dorsal intervals, 2 or 3 in the laterals, 4 to 7 on the commissure.—Rocky mountain slopes, 5000 to 8000 ft., e. Mohave Desert and Death Valley region; e. to Utah.

17. **L. marginàtum** C. & R. Plants 12 to 20 in. high, the peduncles slender, erect, borne on very short stems (1 in. long) rising from the root crown; herbage glabrous or the rays sometimes puberulent; leaves large, 2 to 3 times ternate, then pinnately divided into narrowly linear to filiform segments; flowers whitish or yellowish; fruiting rays few, slender, 1½ to 3½ in. long; pedicels slender, 2 to 3 lines long; bractlets few, narrowly linear, elongated, acuminate, or sometimes none; fruit (immature) elliptic-oblong, glabrous, 3½ to 4 lines long, the wings as broad as the body; dorsal ribs fine or obscure.—Rocky slopes, n. Sierra Nevada foothills from Calaveras Co. to Butte Co., 1000 to 1500 ft.

18. **L. alàtum** C. & R. Similar to no. 17; involucels none; oil-tubes solitary in the intervals.—Sierra foothills in Sacramento Co. Var. PURPÙREUM Jepson. Flowers purple.—Conn Valley, Napa Range.

19. **L. trìternàtum** (Pursh) C. & R. Plants 1½ to 2 ft. high; herbage minutely puberulent; peduncles arising from the root crown or borne on stems 3 or 4 in. long, the parts at base sheathed by scale-like petioles; leaves

twice or thrice ternate, then pinnate, the leaflets narrowly linear, acute, 1 to 4 in. long; flowers bright yellow; fruiting rays very unequal, 1 to 3½ in. long; bractlets setaceous; fruiting pedicels ½ to 2½ lines long; fruit oblong, glabrous, 5 to 5½ lines long; dorsal and intermediate ribs prominent, the wings half the breadth of the body; oil-tubes large, broad, 1 in each interval, 2 on the commissure.—N. Sierra Nevada from Nevada Co. to Modoc Co., thence w. to northern Humboldt Co.; n. to B. C.

20. **L. gigantéum** C. & R. Plants 1¼ to 2¼ ft. high, finely pubescent throughout; leaves very large, ternately compound; leaflets linear-oblong, elongated, 3⅓ to 4¾ in. in length, usually entire, very pale; rays about 11, very unequal, the longer ones 4 in. long; pedicels 1 to 2 lines long; involucel of linear bractlets; flowers yellow; ovary pubescent; fruit linear-oblong, 7 to 9 lines long, with wings much narrower than body, glabrous or nearly so. —Mendocino Co.

21. **L. nudicáule** (Pursh) C. & R. Pestle Parsnip. Fig. 708. Plants 8 to 20 in. high, glabrous; leaves 3¼ to 5¾ in. long, once or twice ternate, then pinnate with 5 to 9 leaflets; leaflets broadly ovate to lanceolate, entire or few-toothed at apex, ¾ to 2¼ in. long; peduncles stoutish, arising from the base, conspicuously enlarged at summit (pestle-like) and bearing 6 to 18 very unequal rays, the outer sometimes 2 to 4 times the length of the inner; rays in fruit dilated at apex, 1 to 6½ in. long; fruiting pedicels 1 to 3 lines long; bracts and bractlets none; flowers yellow; fruit oblong to elliptic, 5 to 7 lines long, 2 to 3 lines wide, the wings ½ the breadth of the body; oil-tubes broad, solitary in the dorsal intervals, 1 or 2 in the laterals, 4 to 6 on the commissure. — Low open foothills or rolling plains: Coast Ranges from Santa Clara Co. to Siskiyou Co.; Sierra Nevada from Amador Co. to Modoc Co.; n. to Wash. Var. pubérulum Jepson. Minutely pubescent.—Mendocino Co.

708. Lomatium nudicaule C. & R.; *a*, leaf x ¼; *b*, fr. umbel x ¼; *c*, fr. x 2½; *d*, sect. carp. x 4.

22. **L. ambìguum** (Nutt.) C. & R. var. **leptocárpum** Jepson. Plants glabrous, 1 ft. high; peduncles ascending from the root-crown of the taproot which is tuberous below; leaves once or twice ternate, then pinnate, the ultimate segments linear, 5 to 10 lines long; rays few, very unequal, 1 line to 3 in. long; bractlets small, linear; flowers yellow; fruit nearly sessile, forming a dense cluster, linear or somewhat lanceolate, 4 to 4½ lines long, the wings very narrow (¼ to ⅓ as wide as the body); oil-tubes solitary in the intervals.—Lassen and Modoc Cos.; n. to Ida., e. to Col.

23. **L. pìperi** C. & R. Indian Biscuit. Plants 1⅓ to 5 in. high, the slender peduncles divaricate, borne on very short erect subterranean stems which rise from globose tubers 4 to 7 lines in diameter; herbage glabrous; leaves biternately divided into linear-lanceolate segments 4 to 12 lines long; umbel 2 to 4-rayed; flowers white; bractlets narrow-lanceolate; fruiting rays 3 to 10 lines long; fruiting pedicels ¼ to 1 line long; fruit elliptic, 2 to 3 lines long, the wings ½ as broad as the body; oil-tubes minute, 2 or 3 in the intervals, 4 on the commissure.—Sierra Co. to Siskiyou Co.; n. to Wash.

32. **PASTINÀCA** L.

Tall branching biennial with angular or fluted leafy stems from thick roots. Leaves large, simply pinnate. Flowers yellow, in compound umbels. Involucre and involucels small or commonly none. Fruit oval, strongly compressed. Lateral ribs winged; dorsal and intermediate ribs filiform. Oil-tubes not quite as long as fruit, solitary in the intervals, 2 to 4 on the commissure. (Latin name of the Parsnip.)

1. **P. sativa** L. COMMON PARSNIP. Fig. 709. Erect, 3 to 4 ft. high; leaflets ovate, serrate or somewhat incised, lobed or even more or less 3 to 5-divided, 3 to 4 in. long; rays 10 to 20, 1 to 2½ in. long; fruit 2½ to 3 lines long; oil-tubes conspicuous. — Cultivated European species, escaped from gardens and now locally naturalized.

709. Pastinaca sativa L.; *a*, leaf x ¼; *b*, fr. umbel x ¼; *c*, carpel x 3; *d*, sect. carp. x 4.

33. **ANÈTHUM** L.

Slender annuals with leafy stems and finely dissected leaves. Flowers yellow, in compound umbels. Involucre and involucels none. Fruit elliptical, flattened dorsally, the lateral ribs narrowly winged. Oil-tubes solitary in the intervals. (Ancient Greek name of the dill.)

710. Oxypolis occidentalis C. & R.; *a*, leaf x ½; *b*, umbel x ½; *c*, fr. x 4; *d*, sect. carp. x 12.

1. **A. gravèolens** L. DILL. Plants usually branching, 1 to 3 ft. high.— Garden plant from Eur., locally naturalized in S. Cal.

34. **OXÝPOLIS** Raf.

Glabrous erect aquatic herbs with fascicled tubers. Leaves ternate or (in ours) pinnate. Umbels compound. Involucre and involucels present. Flowers white. Calyx-teeth evident. Fruit flattened dorsally, ovate to obovate; dorsal and intermediate ribs filiform; lateral ribs broadly winged, the wings closely contiguous to those of the companion carpel and strongly nerved next to the body (thus giving the appearance of 5 dorsal ribs). Stylopodium short-conical. Oil-tubes solitary in the intervals, 2 to 6 on the commissure. (Greek oxys, sharp, and polis, city, application uncertain, possibly referring to the many acute leaflets.)

1. **O. occidentàlis** C. & R. Fig. 710. Plants 2 to 3¼ ft. high; fascicled roots fusiform-fleshy; leaves

simply pinnate, long petioled, the lower 12 to 20 in. long; leaflets 5 to 13, broadly ovate to linear-acuminate, serrate, 1¼ to 4 in. long; fruiting rays 1 to 3 in. long; fruits elliptic-obovate, 2½ to 3 lines long.—Sierra Nevada, 5000 to 9000 ft., from Tuolumne Co. to Tulare Co.

35. **CONIOSELINUM** Hoffm.

Tall branching perennials with leafy stems, glabrous herbage and ternately decompound leaves. Flowers white, in compound umbels. Involucre of few bracts. Involucels of many bractlets. Fruit oblong to obovate, flattened dorsally, with rather prominent stylopodium. Ribs narrowly winged, the lateral usually broadest. Oil-tubes solitary in the intervals, or sometimes 2 in the lateral one, 2 to 4 on the commissure. (Greek koneion, the hemlock, and selinon, parsley.)

1. **C. pacíficum** (Wats.) C. & R. Stems stout, 3 to 5 ft. high; leaves ternate, then pinnate, the 5 or 7 divisions or leaflets ovate in outline, acute, deeply pinnatifid and more or less toothed, ½ to 1¼ in. long; umbels on stout peduncles; rays 15 to 26, 1 to 1½ in. long in fruit; bracts 2 to 4; involucels of several narrowly linear bractlets; fruiting pedicels slender, 3 to 4 lines long; fruit oblong, 3 lines long; wings thickish and corky, rather narrow; oil-tubes conspicuous, 2 on the commissure, solitary in the intervals, sunk in the body of the seed, especially the dorsal ones. — Brushy flats, very rare: Long Valley, Mendocino Co.; Indianola, Humboldt Bay.

711. Angelica hendersonii C. & R.; *a*, leaf x ¼; *b*, umbel x ¼; *c*, fr. x 3; *d*, sect. carp. x 4.

36. **ANGÉLICA** L.

Stout perennials with leafy stems and ternately or pinnately compound leaves. Flowers white, in large terminal compound umbels. Involucre none or scanty. Involucels of few small bractlets or none. Calyx-teeth mostly obsolete. Fruit strongly compressed, elliptic-oblong in outline. Ribs prominent, the lateral broadly winged, the others often narrowly winged. Oil-tubes 1 to 3 in the intervals, 2 to 4 on the commissure. (Latin angelica, angelic, on account of its medicinal properties.)

Maritime species; rays subequal; herbage more or less tomentose; ovary tomentose..... 1. *A. hendersonii.*

Montane species; rays more or less unequal.
Herbage puberulent or eventually glabrous; ovary tomentulose; Coast Ranges and coastal S. Cal.....2. *A. tomentosa.*
Herbage glabrous.
Leaflets not linear.
Ovary pubescent; leaflets narrow-lanceolate to ovate-lanceolate; central and n. Sierra Nevada.....3. *A. breweri.*
Ovary glabrous; leaflets ovate-lanceolate; Siskiyou Co.....4. *A. lyallii.*
Leaflets narrowly linear; s. Sierra Nevada.....5. *A. linearifoba.*

1. **A. hendersònii** C. & R. Fig. 711. Very stout, 2 to 3 ft. high; herbage more or less tomentose, especially on the inflorescence and under surface of the leaves; leaves quinate or ternate, then pinnate; leaflets tending to be crowded, thick, broadly ovate, 1½ to 2½ in. long, obtuse (or rarely acute), serrate; umbels rather condensed; rays in flower subequal; fruiting rays ¾ to 2¼ in. long; umbellets dense, as if capitate; pedicels 1 line long or less;

bractlets 1 or 2, linear-acuminate; fruit broadly oblong, slightly pubescent, 3 to 4 lines long; lateral wings thick and corky, as broad as the body; oil-tubes solitary in the intervals; seed deeply sulcate beneath the oil-tubes.—Along the coast, mostly on or near the sea-bluffs: San Mateo Co. to Humboldt Co.; n. to Wash.

2. **A. tomentòsa** Wats. Stout, 2 to 5 ft. high, the stems and especially the leaves puberulent, or sometimes nearly glabrous; leaves bipinnate or ternate or quinate and then pinnate; leaflets ovate, acute, acutish or often long-pointed, sometimes varying to lanceolate or roundish, irregularly serrate, obliquely 2-lobed, or not lobed and merely oblique, 1½ to 3 (or 6) in. long; petioles strongly dilated at base; fruiting rays 1 to 5 in. long; fruiting pedicels 2 to 3 lines long; ovary tomentulose; fruit oblong or elliptic, glabrous, 3 to 4½ lines long; dorsal and intermediate ribs small and acutish; lateral wings nearly equaling the body in breadth; oil-tubes 1 in the intervals, or sometimes 2 in the lateral intervals, mostly 2 on the commissure; seed somewhat sulcate beneath the oil-tubes.—Coastal S. Cal.; n. through the Coast Ranges to Humboldt Co. Var. CALIFÓRNICA Jepson. Rays very unequal (1¼ to 5¾ in. long), scaberulous at the ends; oil-tubes 2 (or 3) in the intervals, mostly 4 in lateral pairs on the commissure. — Yaca Mts.

3. **A. brèweri** Gray. Stems 3 to 5 ft. high; herbage glabrous; leaves ternate, or quinate, then pinnate; leaflets lanceolate to oblong or occasionally ovate-lanceolate, acuminate, sharply serrate, 1½ to 4 in. long; rays many, 1½ to 2½ in. long in fruit; pedicels 2 to 3½ lines long; rays and pedicels not "web-footed" or very obscurely so; pedicels and ovaries whitish-puberulent; fruit oblong or somewhat narrowed below, pubescent or becoming glabrous, 3 to 4½ lines long; dorsal and intermediate ribs more or less prominent; lateral wings as wide as the body; oil-tubes 1 or 2 in the intervals.—Sierra Nevada, 4500 to 8000 ft., from Mariposa Co. to Nevada Co.

4. **A. lyállii** Wats. Plants 2 to 4 ft. high; herbage and inflorescence glabrous; leaves biternate, then pinnate; leaflets ovate-lanceolate, serrate, 1½ to 3½ or 5 in. long; fruiting rays 1½ to 2½ in. long, the outer row somewhat coalescent at base so as to be web-footed; outer row of pedicels similarly coalescent; fruit broadly oblong to obovate, 3 to 3½ lines long; dorsal and intermediate ribs sharply salient, equal; lateral wings about as broad as the body; oil-tubes solitary in the intervals.—Siskiyou Co.; n. to Alb.

5. **A. linearilòba** Gray. Stout, glabrous, 2 to 3 ft. high; leaves 2 or 3 times ternate, then pinnate with about 5 (3 to 9) leaflets; leaflets linear or linear-lanceolate, 1 to 3 in. long, 1 to 2 lines wide, entire or often with a pair of coarse teeth towards the base, frequently decurrent on the rachis; fruiting rays 1 to 2 or 3¾ in. long; involucre and involucels none; fruit oval-oblong, glabrous, 4 to 6 lines long; dorsal and intermediate ribs filiform; lateral wings thickish, a little narrower than the body; oil-tubes solitary in the dorsal intervals, in pairs in the laterals.—Montane, 6400 to 9500 ft., Sierra Nevada from Mariposa Co. to Tulare Co. Var. CULBERTSÒNII Jepson n. var. Leaf-segments 4 to 4½ lines wide.—Little Kern River (Culbertson 4276, type).

37. COELOPLEÙRUM Ledeb.

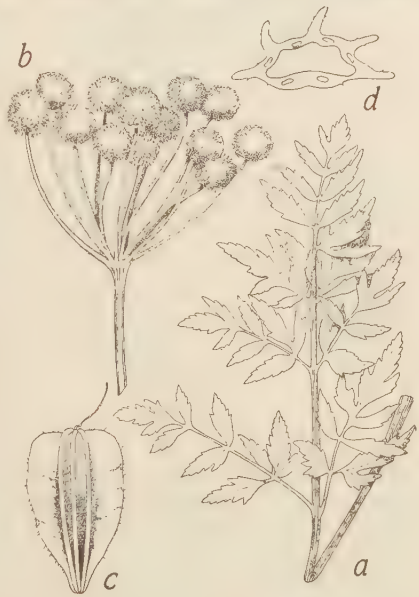
Very stout perennial herb of the sea-coast with glabrous herbage. Leaves uni-, bi- or tri-ternate, with very large inflated petioles. Flowers greenish-white, in many-rayed umbels. Involucre of few narrow bracts, sometimes foliaceous. Involucel of many linear-lanceolate bractlets. Fruit elliptic-oblong, not flattened dorsally. Ribs very thick and corky, becoming hollow, equal or the lateral ones a little broader. Oil-tubes small, 1 in the intervals, 1 or 2 under each rib, 2 to 4 on the commissure. (Greek koilos, hollow, and pleuron, rib, referring to the cavity made by the intruded ribs.)

1. **C. maritimum** C. & R. Stems corymbosely branched, 2 to 3 ft. high; leaflets roundish to ovate, crenate, 1¼ to 4 in. long; rays 1 to 1¾ in. long; fruits 2½ to 3 lines long, the lateral ribs twice as broad as the others.—Central Humboldt Co. coast; n. to Wash.

38. SPHÈNOSCIÀDIUM Gray

Perennials with thick roots. Stems stout, tall, nearly simple, glabrous. Leaves once or twice pinnate with bladdery dilated petioles. Flowers white (or sometimes purplish), sessile on enlarged receptacles and forming compact heads, the heads borne on tomentose rays in a medium-sized umbel. Involucre none. Involucels of many linear-setaceous bractlets. Calyx-teeth none. Fruit cuneate-obovate, flattened, subglabrous. Ribs prominent, winged above, the dorsal and intermediate ones narrow, the lateral broader. Oil-tubes solitary in the intervals, 2 on the commissure. Seed face plane. (Greek sphenos, a wedge and sciadios, an umbrella, referring to the umbel.)

1. **S. cápitellàtum** Gray. Fig. 712. Stems very stout, 3 to 5 ft. high; leaves large, glabrous; leaflets or segments linear-lanceolate to oblong or oblong-ovate, serrate or coarsely and saliently few-toothed above, more or less entire below; rays 4 to 8 (or 14), subequal, 1 to 2 (or 4) in. long; flowers pubescent; involucels of a few deciduous bractlets; fruit cuneate-obovate, 3 lines long. — Montane, 3500 to 10,000 ft.: San Bernardino Mts.; White Mts.; Sierra Nevada from Kern Co. to Modoc Co., thence w. to Siskiyou Co. Var. SCÀBRUM Jepson. Almost as tall as in the species; leaves scabrous, in shape similar to the species. — Sierra Nevada to the San Jacinto Mts., 8000 to 10,000 ft. Foliage often paler than in the species. Var. VÁLIDUM Jepson n. comb. Plant markedly puberulent in all its parts with large leaves and ovate leaflets. — Mariposa Co., 3500 to 4500 ft. (S. validum Congdon.) Var. ERÝNGIIFÒLIUM Jepson n. comb. More or less condensed plants; leaves more or less scabrous, finely dissected, the segments somewhat divaricate, about 1 line wide; fruits 4 lines long, sparingly hairy. —High montane, 8000 to 10,000 ft., Mariposa Co. Foliage often paler than in the species. (S. eryngiifolium Greene.)



712. Sphenosciadium capitellatum Gray; *a*, leaf x ⅛; *b*, umbel x ½; *c*, fr. x 3; *d*, sect. carp. x 5.

39. CYMÓPTERUS Raf.

Perennial herbs with basal leaves. Herbage glabrous (except in no. 6). Leaves usually ternate, then once to thrice pinnate and much dissected or incised. Involucre usually lacking. Involucels always present. Flowers yellow, white or purple, in compound umbels. Calyx-teeth usually evident. Fruit oblong to orbicular, mostly dorsally flattened, the carpels 3 to 5-winged. Stylopodium wanting. Oil-tubes several in the intervals, 2 to many on the commissure. Seed flat to very slightly or not at all dorsally flattened. (Greek kuma, wave, and pteron, wing, the ribs in some species with undulate wings.)

Wings of carpels thin, undulate-crisped (except in the var.); tall plants; Sierra Nevada and mts. of n. Cal. ..... 1. *C. terebinthinus.*

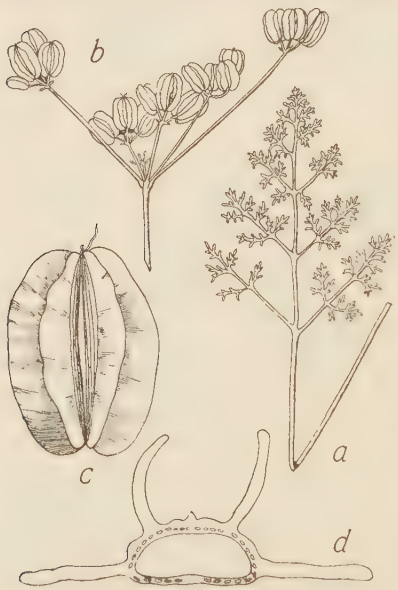
Wings of carpels commonly thickened or corky at insertion, sometimes corky throughout. Small plants of the deserts and desert slopes of mountain ranges.

Flowers in umbels; wings of carpels entire.

Leaves light green, the ultimate segments lanceolate or oblong, 1 to 2 lines long; involucre none or of a few small bracts. . 2. *C. panamintensis.*

Leaves grayish, the ultimate divisions ovate, 4 to 6 lines long, crenate or incised; involucre very conspicuous.....3. *C. utahensis.*
Flowers in dense globose heads.
Wings of carpels with shredded margins; foliage glabrous..4. *C. deserticola.*
Wings of carpels entire; foliage minutely pubescent.....5. *C. cinerarius.*
Low plants of sandy sea-shores; umbellets capitate.....6. *C. littoralis.*

1. **C. terebínthinus** (Hook.) T. & G. Fig. 713. Plants ½ to 1½ ft. high, the leaves all basal; peduncles about twice as long as the leaves, arising from the shortly branched caudex which is clothed with persistent leaf sheaths; leaves 2 to 6 in. long, on petioles about as long, usually ternate, then 1 to 3 times pinnate and pinnately dissected into short linear segments about 1 line long; umbels with unequal rays, no involucre and involucels of linear acuminate bractlets; flowers yellow; fruiting rays 1 to 3 in. long; fruiting pedicels 3 to 5 lines long; fruit broadly oblong to nearly orbicular, 4 to 6 lines long; carpels with 3 to 5 broad thin undulate crisped wings, or one carpel with broad wings (especially the lateral wings) and the companion carpel with wings narrow and much reduced; oil-tubes very small, 4 to 9 in the intervals, 8 to 16 (or 20) on the commissure side.—Montane, 5000 to 9000 ft.: Sierra Nevada from Tulare Co. to Lassen Co.; n. to Wash. Var. CALIFÓRNICUS Jepson n. comb. Wings of carpels not undulate-crisped; leaves with ultimate divisions ovate to almost linear; involucels of small linear bractlets; fruit oblong, 3 to 4 lines long; intermediate and dorsal wings sometimes reduced in breadth; oil-tubes 3 to 5 in the intervals, 6 on the commissure.—N. Sierra Nevada, 1500 to 5000 ft., from Nevada Co. to Lassen Co., thence w. to Siskiyou Co. (Pteryxia californica C. & R.)



713. Cymopterus terebinthinus T. & G.; *a*, leaf x ½; *b*, fr. umbel x ½; *c*, fr. x 3; *d*, sect. carp. x 5.

2. **C. panaminténsis** C. & R. Plants low (3 to 10 in. high); peduncles purplish, arising from a short caudex sheathed with old leaf bases; leaves 2 to 2¾ in. long, on petioles about as long, ternate, then once or twice pinnate, the pinnae finely dissected; ultimate segments 1 to 1½ lines long, tipped with a slender bristle-like apiculation; rays in fruit 1 to 1½ in. long; pedicels short; involucre none; involucels small, gamophyllous, somewhat one-sided, purplish, cleft into ovate acuminate segments; flowers greenish-yellow; fruit 4½ lines long, glabrous, each carpel with 5 broad wings, the wings very thick at insertion; oil-tubes 3 or 4 in the intervals, 4 or 5 on the commissure; seed face deeply concave.—E. Mohave Desert; Death Valley region.

3. **C. utahénsis** Jones. Plants 3 to 5 in. high, the peduncles equaling or exceeding the leaves; leaves gray-pallid, ternate, then bipinnatifid; ultimate segments ovate in outline, 4 to 6 lines long, crenate or incised; umbels more or less compacted; involucres of conspicuous hyaline bracts with prominent green or purplish nerves; involucels resembling the involucres; flowers purple; fruit orbicular, 4 to 6 lines long, its body oblong; ribs with broad membranous wings (often corky-thickened next the body of the carpel); carpels flattened with 5 broad thin wings; oil-tubes 2 in the intervals, 4 on the commissure.—E. Mohave Desert; e. to Utah and N. Mex.

4. **C. desertícola** Bdg. Plants 4 to 6 in. high, the peduncles and leaves rising from among the old petioles of the root-crown, peduncles ascending, a little exceeding the leaves; leaves glabrous, triangular in outline, 2 in. long, bi- or tri-ternate, then pinnately parted; segments with acute bristle-tipped lobes; petioles 2½ to 3½ in. long; involucre with short linear bracts; flowers dark purple, crowded in a globose head ½ to ¾ in. in diameter; fruits 2 lines long, sessile; lateral wings thick, corky, narrow, pubescent, with the margins shredded; oil-tubes minute and numerous, forming a continuous chain.—Mohave Desert.

5. **C. cinerárius** Gray. Plants 2 in. high, the peduncles and leaves from a short more or less horizontal subterranean caudex; leaves (in outline) somewhat cordate, bipinnate, with pinnately divided segments, glaucous and cinereous with a very minute harsh pubescence; rays few, short or almost none; involucels of numerous united somewhat membranous long-acuminate segments; flowers purplish; fruit 2½ lines long, the 5 wings of each carpel rather narrow and thick at insertion; oil-tubes 3 in the intervals, several on the commissure; seed face with narrow and deep concavity.—High e. slope of the Sierra Nevada in the Mono Lake region; also White Mts., Inyo Co.

6. **C. littorális** Gray. Peduncles and leaves spreading or prostrate, arising from very short stems; leaves simply ternate, 4 to 9 in. long, longer than the peduncles, densely white-tomentose beneath; petioles 2 to 4 in. long; leaflets ovate or roundish in outline, 1 to 2½ in. long, either the terminal or lateral or all 3 leaflets often 3-parted or -divided, their margins callous-serrate or -dentate; umbel compact, hemispherical, resting on the sand; rays ¾ to 1¼ in. long; umbellets capitate; flowers white, bracts and bractlets subulate; fruit dorsally flattened, each carpel bearing 5 equal broad corky wings 1½ to 2 lines wide, the fruit therefore subglobose in outline, 4 to 5 lines in diameter; oil-tubes 2 or 3 in the intervals, 4 or 6 on the commissure; seed face somewhat concave.—Sandy sea-beaches, Mendocino Co. to Del Norte Co.; n. to Alas.

GARRYÀCEAE. Silk Tassel Family

Shrubs or small trees with quadrangular branchlets. Leaves simple, opposite, with short petioles. Flowers dioecious, apetalous, borne along a pendulous catkin-like axis, 1 (in case of the pistillate) or a cyme of 3 (in case of the staminate) in the axil of each of the decussately connate bracts. Staminate flower:—calyx 4-parted into linear valvate sepals; stamens 4; filaments distinct. Pistillate flower:—calyx with a shortly 2-lobed or obsolete limb; ovary inferior, 1-celled, with 2 pendulous ovules; styles 2, stigmatic on the inner side, persistent. Fruit a berry; epicarp at maturity dry and brittle, free from the pulpy portion and dehiscing irregularly, or sometimes circumcissile. Seeds with thin testa and horny endosperm, the minute embryo at one end.

1. GÁRRYA Dougl.

The only genus. (Nicholas Garry, of the Hudson Bay Co., friend of David Douglas, botanical explorer of Pacific North America, 1825-1832.)

Pubescence of tangled curly hairs forming a close felt on under surface of the leaves; leaves glabrous above.
Leaves decidedly undulate-margined, more or less pubescent beneath; Coast Ranges... 1. *G. elliptica.*
Leaves plane, felty-pubescent beneath; Sierra Nevada and S. Cal.....2. *G. veatchii.*
Pubescence of straight silky hairs or almost glabrous; leaves plane.
Leaves bright green above, glabrous above and also below or nearly so; fruit glabrous or mostly so; North Coast Ranges and Sierra Nevada.....3. *G. fremontii.*
Leaves glaucous-gray above, white-silky beneath; fruit silky-pubescent; Sierra Nevada and S. Cal.....4. *G. flavescens.*

1. **G. ellíptica** Dougl. Silk Tassel Bush. Fig. 714. Commonly a shrub 5 to 8, or rarely a small tree up to 20 ft. high; leaves elliptical or narrower, the margin undulate and more or less revolute, glabrous above, tomentose beneath with short curly or wavy hairs, 1½ to 2½ in. long; catkins solitary or clustered, the staminate 4 to 7 in. long, with truncate or acute silky bracts and the calyx-segments cohering at tip, the pistillate shorter, 2 to 4 in. long.

714. Garrya elliptica Dougl.; *a*, staminate branchlet x ½; *b*, pistillate catkin x ½; *c*, staminate fl. x 2; *d*, pistillate fl. x 2; *e*, capsule x 1.

with acute or acuminate bracts; ovary sessile; fruit globose, 3 to 5 lines in diameter, densely white-tomentose, in extreme age glabrate; seed oval, 2 lines long.—Common, Coast Ranges, especially the seaward ranges, from Monterey Co. to Humboldt Co., 100 to 2500 ft. Feb. Foliage suggestive of Quercus agrifolia.

2. **G. vèatchii** Kell. Shrub 6 to 8 ft. high; leaves oval, 1 to 2 in. long, slightly undulate, short-acuminate or almost aristate, short-petioled, smooth and shining above, densely tomentose below with short very fine closely curled hairs; fruit densely pubescent, 2½ to 4 lines in diameter.—Dry slopes, 800 to 5000 ft.: coastal S. Cal.; n. to Santa Cruz Mts. and to Eldorado Co.

3. **G. frémóntii** Torr. Bear Brush. Shrub 5 to 7 (or 10) ft. high; leaves elliptical, varying to oblong, tapering to each end, glabrous and shining above, gray-puberulent or white-tomentose beneath, in age often very glabrous and yellow, particularly on the under surface, not undulate, 1¼ to 2½ in. long, on petioles 6 lines long; catkins solitary or in clusters of 2 to 6, with acute somewhat silky bracts; staminate catkins 2 to 3 in. long; pistillate catkins about 1½ in. long, the ovary and young fruit very silky; fruiting catkins 1½ to 3½ in. long; mature fruit purple to black, glabrous, 3 lines long, short-pedicelled; seeds subglobose or oval, 1½ lines long.—Dry ridges and slopes, 2500 to 7000 ft.: North Coast Ranges; Sierra Nevada; coastal S. Cal. Mostly in the dry inner ranges and a member of the chaparral. Feb. In the s. Sierra Nevada there are intergrades to no. 4.

4. **G. flavéscens** Wats. Large spreading shrub 6 to 12 ft. high; herbage more or less pubescent with closely appressed straight silky hairs and with a glaucous gray color over entire plant; leaves oval to elliptic, entire, acute at each end and recurved-mucronulate at apex, lower surface more or less densely pubescent, upper with scattered irregularly appressed hairs or glabrous, 1½ to 3 in. long; catkins solitary or clustered, the fertile short and thick; fruit globose, densely pubescent, almost sessile, 3 lines in diameter.—Arid mts., 4750 to 7000 ft.: coastal S. Cal., n. to San Benito Co. and to Tulare Co.; e. to Utah. (G. pallida Eastw.) Var. buxifòlia Jepson n. comb. Low shrub 2 to 5 ft. high; leaves small, elliptic-ovate, 1 to 1½ in. long, glossy or green and glabrous above, silky-tomentose beneath.—Lake and Mendocino Cos. to Del Norte Co.; sw. Ore. (G. buxifolia Gray.) Var. venòsa Jepson n. var. Leaves elliptic, acute, 1 to 3 in. long, very white-silky beneath, green and strigose above, purple-veined, tipped with a cuspidate point ½ line long.—Foothills of the Yollo Bolly Mts., w. Tehama Co. (Jepson 178f, type).

CORNÀCEAE. Dogwood Family

Deciduous trees or shrubs, or some species low and merely suffrutescent. Leaves opposite, simple, entire. Flowers perfect, regular, in cymes or heads. Calyx-tube coherent with the ovary, its limb represented by 4 small teeth at the summit or none. Petals 4, epigynous, valvate in bud. Stamens 4, alternate with the petals. Ovary 2-celled with a single pendulous ovule in each

cell; style 1, filiform; stigma simple. Fruit a drupe, the stone 2-celled with 1 seed in each cell. Embryo minute.

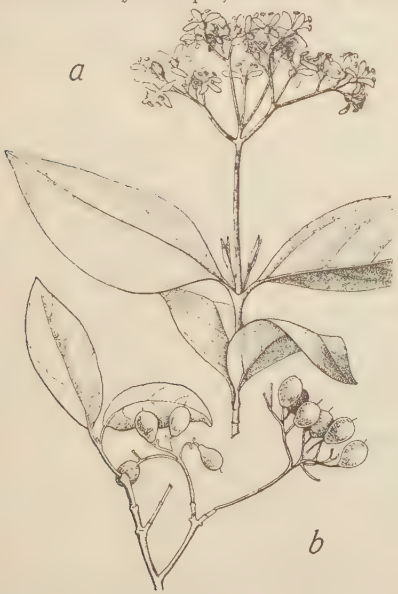
1. **CÓRNUS** L. Cornel. Dogwood

Flowers greenish or white. (Latin cornu, a horn, on account of the hardness of the wood.)

Flowers appearing after the leaves, borne in cymes, the cymes not involucrate.
Leaves lighter color beneath, minutely puberulent; style glabrous; drupe commonly white. . . . . 1. *C. californica.*
Leaves green, alike on both faces, nearly glabrous; style slightly pubescent; drupe bluish or pale. . . . . 2. *C. glabrata.*
Flowers appearing before or with the leaves, the inflorescence involucrate.
Flowers yellowish, in sessile umbels with an involucre of 4 small caducous bracts; drupe black. 3. *C. sessilis.*
Flowers greenish, in heads, with a conspicuous involucre of 4 to 6 white petal-like bracts; drupe red.
Tree or shrub. . . . . 4. *C. nuttallii.*
Herb-like with creeping rootstock. 5. *C. canadensis.*

715. Cornus californica C. A. Mey.; *a*, fl. branchlet x ½; *b*, fl. x 2; *c*, fr. cluster x ½.

1. **C. californica** C. A. Mey. Creek Dogwood. Fig. 715. Shrub 5 to 15 ft. high with smooth purplish branches and branchlets; leaves commonly ovate, varying to elliptical, acute, thinly puberulent, 2 to 4 in. long; cymes 1½ to 2 in. broad; petals oblong, acute, 2 lines long; styles glabrous; drupe white, subglobose, 3 lines in diameter; stone mostly oblique, somewhat flattened, with furrowed edges, each side with 4 less obvious or shallower channels. — Stream banks in cañons and along rivers in the valleys, 10 to 6000 ft.: coastal S. Cal. (rare); Coast Ranges; Great Valley; Sierra Nevada foothills (C. pubescens var. californica C. & E.). Var. PUBÉSCENS (Nutt.) Mcbr. Inflorescence shaggy-pubescent. — Tulare Co.; Mendocino Co.; n. to Ore. (C. pubescens Nutt.). Var. NEVADÉNSIS Jepson n. var. Inflorescence scantily puberulent; drupe blue.—Sierra Nevada, 3000 to 4000 ft. (Rich Pt., Middle Fork Feather River, Jepson 10,629, type).



716. Cornus glabrata Benth.; *a*, fl. branchlet; *b*, fr. branchlet. x ½.

2. **C. glabràta** Benth. Fig. 716. Shrub 5 to 12 (or 18) ft. high, with nearly or quite glabrous twigs; leaves ovate or oblong, acute at each end or shortly pointed at apex, 1¼ to 2 in. long, green on both faces, obscurely pubescent with short scattered appressed hairs; petioles 3 lines long or less; flowers dull white, many in small cymes; style slightly pubescent; drupe globose, the flesh whitish or bluish; stone little compressed and not at all or obscurely furrowed. —Common along the bases of low

hills, often forming thickets, and also along streams or borders of swamps from Mendocino Co. and Tulare Co. s. to San Diego Co.

3. **C. séssilis** Torr. Clumpy shrubs or small trees, 5 to 9 (or 13) ft. high; leaves obovatish, acute, 2 to 3½ in. long, shortly petioled; flowers yellowish, in small sessile umbellate clusters subtended by 4 small caducous bracts; pedicels 2 to 3 lines long; drupe oblong, at first greenish-white, then yellow, then red, maturing purple-black, shining, 5 to 6 lines long, on a pedicel as long. — Foothills, commonly forming stream-bank thickets, 1800 to 3500 ft.: Sierra Nevada from Amador Co. to Tehama Co., thence to Trinity and Humboldt Cos.

717. Cornus nuttallii Aud.; *a*, fl. branchlet x ⅓; *b*, fl. x 3; *c*, fr. cluster x ½.

4. **C. nuttállii** Aud. MOUNTAIN DOGWOOD. Fig. 717. Tree 10 to 30 (or 45) ft. high; leaves narrow- or elliptic-obovate or even orbicular, with rounded or shortly acute apex 3 to 5 in. long, on petioles 2 to 3 lines long; flowers crowded in a head on a thick convex receptacle and surrounded by a conspicuous petal-like involucre; bracts of the involucre commonly 6, white, sometimes tinged with red, obovate to oblong, 1½ to 3 in. long, abruptly acute or acuminate; heads ½ to 1 in. broad, very dense, borne on peduncles 1 to 1¼ in. long; drupe 5 to 6 lines long, scarlet.—Mountain woods, 1500 to 5100 ft.: cismontane Cal.; n. to B. C.

5. **C. canadénsis** L. BUNCH-BERRY. Herb-like; stem 3 to 9 in. high with a whorl of 4 to 6 leaves at summit and a pair of leaves about the middle; involucre petal-like, its bracts broadly ovate, 5 to 8 lines long.—Swamps, Mendocino Co.; Ore. to Alas. and N. Eng.

SYMPETALAE

Calyx usually present. Petals more or less united below, commonly tubular. Stamens inserted on corolla. Pistil 1 and compound (except Asclepiadaceae and Apocynaceae).

LENNOÀCEAE. LENNOA FAMILY

Root-parasitic brown herbs with fleshy stems and scale-like leaves. Flowers perfect, in spikes or heads. Calyx parted into linear nearly distinct segments. Corolla tubular, the border 5 to 7-lobed. Stamens as many as the corolla-lobes, inserted on the throat. Ovary fleshy, 6 to 14-celled, each 2 cells representing one true cell divided by a false partition; style 1; stigma crenulate or obscurely lobed. Fruit concealed in the persistent calyx and corolla, finally splitting into 12 to 28 1-seeded nutlets.

Flowers in a spike; calyx glabrous.....1. PHOLISMA.
Flowers in a saucer-shaped head; calyx hairy.....2. AMMOBROMA.

1. PHOLÍSMA Nutt.

Stem simple, ending in a simple or compactly branched dense spike. Sepals 5, 6 or 7, naked. Corolla border undulate-plicate, spreading, shallowly 5, 6 or 7-lobed, each lobe emarginate. (Greek pholis, a scale, referring to the scaly stem.)

1. **P. arenàrium** Nutt. Plant 6 to 10 in. high; spikes oblong, rarely capitate, 1 to 5 in. long; corolla purplish with white border, 2 lines broad.—Sandy soil, Mohave and Colorado deserts and w. to the coast: Barstow; Coyote Holes; Borrego Sprs.; Santa Monica; Manhattan Beach; San Diego

On roots of Hymenoclea salsola, Ericameria ericoides, Chrysothamnus nauseosus var. graveolens, Eriodictyon tomentosum, Abronia umbellata and Eriogonum parvifolium.

2. **AMMOBRÒMA** Torr. Sand Food

Stem simple, ending above in a saucer-shaped head thickly clothed with flowers. Sepals 6 to 10, filiform, plumosely hairy, as long as the corolla or somewhat longer. Corolla purple, tubular, 6-lobed, the lobes very short, emarginate. (Greek ammos, sand, and broma, food.)

1. **A. sonòrae** Torr. Sand Food. Plant 4 to 16 in. long, buried in the sand up to the very woolly head.—Sand hills: Colorado Desert (Ogilby near Hedges Mine); s. to Sonora, Mex. The stems and tubers are boiled or roasted by the Gulf Indians and taste like sweet potatoes.

ERICÀCEAE. Heath Family

Trees, shrubs or perennial herbs. Leaves simple, alternate in all our genera except three, mostly evergreen and stiff and coriaceous. Flowers white or red, regular and symmetrical, with the parts in 5s, rarely in 4s. Stamens free from the corolla, as many or commonly twice as many as its lobes or petals and distinct from them; anthers 2-celled, opening by a terminal pore or sometimes longitudinally, frequently bearing two awn-like appendages. Ovary superior or inferior, 4 to 10 (rarely 1, 2 or 3)-celled, with usually axile placentae bearing numerous ovules. Style 1; stigma 1, entire or merely lobed. Corolla in most cases sympetalous but sometimes choripetalous. Rhododendron has a slightly irregular corolla. Calyx persistent. Flowers often pendulous. Leaves opposite in Chimaphila, Kalmia and Cassiope.

A. Herbs or herb-like plants; corolla choripetalous (except nos. 7 to 9); anthers without awns (except no. 7); ovary superior.

Plants with evergreen leaves (one species leafless); corolla choripetalous.—Subfamily Pirolaceae.
- Stems leafy; flowers corymbose or umbellate; filaments with a roundish dilation at the middle; style short ..... 1. Chimaphila.
- Stems leafy at base only; filaments not dilated; style commonly elongated.
  - Flowers solitary; stigma with 5 radiating lobes ..... 2. Moneses.
  - Flowers racemose; stigma 5-lobed or -toothed ..... 3. Pirola.

Humus plants or saprophytes without green leaves.—Subfamily Monotropaceae.
- Ovary 4 to 7-celled.
  - Corolla none; stems streaked red and white ..... 4. Allotropa.
  - Corolla present.
    - Corolla choripetalous; ovary seated on an 8 to 12-toothed disk, the teeth deflexed.
      - Stems 1-flowered ..... 5. Monotropa.
      - Stems several-flowered ..... 6. Hypopitys.
    - Corolla sympetalous; disk none.
      - Anthers awned; corolla 2½ lines long ..... 7. Pterospora.
      - Anthers not awned; corolla 6 to 9 lines long ..... 8. Sarcodes.
- Ovary 1-celled.
  - Corolla sympetalous; filaments hairy ..... 9. Newberrya.
  - Corolla with distinct petals; filaments glabrous ..... 10. Pleuricospora.

B. Shrubs or trees (often small or diminutive shrubs); corolla sympetalous (except no. 11).

Ovary wholly superior.—Subfamily Ericineae.
- Fruit a dry capsule.
  - Anthers awnless; capsule septicidal.
    - Corolla with distinct petals; leaves resin-dotted beneath ..... 11. Ledum
    - Corolla sympetalous (as in all the following).
      - Large shrubs with broad leaves; leaf-buds scaly.
        - Corolla funnelform, 5-lobed; calyx not ciliate. 12. Rhododendron
        - Corolla cylindric-urnshaped, 4-lobed; calyx bristly-ciliate ..... 13. Menziesia.
      - Diminutive alpine shrubs with narrow small leaves; no scaly leaf-buds.
        - Corolla saucer-shaped with 10 pockets holding the anthers ..... 14. Kalmia
        - Corolla open-campanulate, without pockets ..... 15. Phyllodoce
  - Anthers awned or mucronate; capsule loculicidal.
    - Corolla cup-shaped; anthers awned; leaves scale-like, imbricated, sessile .... 16. Cassiope.
    - Corolla ovate with narrow orifice; anthers not awned, merely mucronate; leaves broad, petioled ..... 17. Leucothoe.

Fruit a berry or drupe.
Calyx tubular, becoming fleshy in fruit and enclosing the capsule; anthers awned or awnless; flowers in a raceme.....18. GAULTHERIA.
Calyx with distinct sepals, dry, persistent in fruit but insignificant; anthers awned; fruit a berry or berry-like.
Surface of fruit granular.
Flowers in a panicle; calyx glabrous.....19. ARBUTUS.
Flowers in a raceme; calyx tomentose.....20. COMAROSTAPHYLIS.
Surface of fruit smooth or merely glandular; flowers in a panicle, rarely in a raceme.....21. ARCTOSTAPHYLOS.
Ovary wholly inferior.—Subfamily VACCINIACEAE.....22. VACCINIUM.

1. CHIMÁPHILA Pursh. PIPSISSEWA

Low perennial evergreen suffrutescent plants. Leaves alternate or in irregular whorls, serrulate. Flowers white, waxy, in a terminal naked corymb. Calyx 5-parted. Corolla rotate, choripetalous; petals 5, orbicular, concave. Stamens 10; filaments dilated and hairy in the middle. Stigma orbicular-peltate, crowning the very short style which is concealed in the umbilicate summit of the ovary. Capsule 5-celled, dehiscent from above downwards. (Greek cheima, winter, and phileo, to love, the plants evergreen.)

Leaves oblanceolate, many; peduncles 3 to 6-flowered.....1. *C. umbellata.*
Leaves ovate, few; peduncles 1 to 3-flowered.....2. *C. menziesii.*

1. **C. umbellàta** Nutt. PRINCE'S PINE. Stem often simple, 6 to 10 or 12 in. high, bearing several clusters or whorls of leaves and 3 to 6-flowered peduncles; leaves oblanceolate, varying to oblong, sharply serrate from near the base, 1½ to 2½ in. long; flowers 3 lines broad, pinkish or flesh-color; filaments with a roundish dilation at base which is hairy on the margin only. —Pine woods, 1000 to 6000 ft., rather common: San Jacinto and San Bernardino mountains; Sierra Nevada; Coast Ranges; N. Am.; Eur., Asia.

2. **C. menzièsii** Spreng. More or less branched from the base, 3 to 6 in. high; leaves ovate, mostly acute, serrulate or entire, ¾ to 1½ in. long; peduncles 1 to 3-flowered; filaments with a roundish dilation at the middle which is covered with short hairs.—Pine woods, 3500 to 6500 ft., infrequent: Cuyamaca, San Jacinto, San Bernardino and San Gabriel mountains; Sierra Nevada; North Coast Ranges; n. to B. C.

2. MONÈSES Salisb.

Perennial herbs with a solitary white or pink flower drooping at the summit of a slender scape. Leaves thin, opposite or whorled, clustered at the ascending ends of underground shoots. Calyx 5- (or 4)-parted. Petals 5 (or 4), rotate, distinct. Stamens 10 or 8. Stigma peltate, with 5 narrow radiating lobes. Capsule 4 or 5-celled, loculicidal from the summit, its valves not cobwebby. (Greek monos, single, and esis delight, the plant one-flowered.)

1. **M. uniflòra** Gray. Scape 2 to 5 in. high; leaves roundish-ovate, serrate-dentate, reticulately veined, 4 to 8 lines broad; flower fragrant, 6 to 8 lines broad.—Cool forests, Siskiyou Co., very rare with us; Ore. to Alas., e. to Lab.; Eur., Asia.

3. PÍROLA L. WINTERGREEN

Perennial herbs with slender rootstocks, basal evergreen leaves (rarely leafless), and leafless scapes. Flowers 5-merous, in a terminal raceme. Calyx 5-parted. Petals 5, distinct, concave or incurved, more or less converging. Stamens 10; filaments subulate, naked. Stigma 5-lobed or -toothed, on an elongated style. Capsule 5-celled, depressed-globose and 5-lobed, umbilicate at apex and base, dehiscent from the base upward; edges of the valves cobwebby when opening, persistent on the axis. Embryo minute. (Diminutive of Pirus, classical name of the Pear Tree, on account of resemblance in the leaves of one species.)

Stigma peltate, without ring or collar,
Obviously 5-lobed; style included.....1. *P. minor.*
Obscurely 5-lobed; style exserted a little.....2. *P. secunda.*
Stigma 5-lobed, subtended by a distinct ring or collar.
Stigma close to ring.
Stigma deeply lobed.
Stigma with narrow erect or spoke-like lobes.....3. *P. picta.*

Stigma short-oblong, sometimes much reduced.....4. *P. dentata.*
Stigma shallowly lobed.....5. *P. aphylla.*
Stigma lifted high above ring.....6. *P. asarifolia.*

1. **P. minor** L. Scapes 5 to 8 in. high; leaves roundish, 8 to 11 (or 15) lines long, the margined petiole mostly shorter than the blade; flowers white or rose-color, crowded; corolla globose.—High montane, 8000 to 10,000 ft., rare in Cal.: San Jacinto and San Bernardino mountains; Sierra Nevada from Tulare Co. to Modoc Co.; N. Am.; Eur., Asia.

2. **P. secúnda** L. Scapes 4 to 7 in. high; leaves ovate, serrulate, thin and greenish, ¾ to 1¾ in. long; flowers white, in a one-sided dense raceme; petals with two tubercles at base inside.—Montane, 4500 to 7800 ft.: San Jacinto and San Bernardino mountains; Sierra Nevada from Fresno Co. to Modoc Co.; Humboldt Co. to Siskiyou Co.; n. to Alas., e. to N. Eng.; Eur., Asia.

3. **P. pícta** Sm. WHITE-VEINED SHIN-LEAF. Fig. 718. Scapes 8 to 15 in. high; leaves ovate to elliptic, very coriaceous, mottled or veined with white, entire or serrulate, 1 to 2¼ in. long, the petiole narrowly winged; calyx-lobes broadly ovate, usually acute; corolla greenish-white or brownish flesh-color.—Pine forests, 4000 to 6000 ft.: San Jacinto and San Bernardino mountains; Sierra Nevada; Mendocino Co. to Mt. Shasta; n. to B. C., e. to Wyo.

718. Pirola picta Sm.; *a*, habit x ⅜; *b*, stamen x 2½; *c*, pistil x 2.

4. **P. dentàta** Sm. Similar to no. 3; leaves obovatish, serrulate, 1 to 1½ in. long; petals cream-color; style sometimes nearly straight. — Mendocino coast; n. to B. C. Var. ÍNTEGRA Gray. Leaves ovate, entire, glaucous, not white-veined.—Montane, 5000 to 7000 ft.: San Gabriel and San Bernardino mountains; Sierra Nevada from Fresno Co. to Modoc Co., thence w. to Siskiyou and Humboldt Cos.; n. to Wash. (P. pallida Greene.)

5. **P. aphýlla** Sm. Leafless parasite; scapes red, often many and clustered, from a scaly-bracted rootstock, 6 to 9 (or 16) in. high; calyx red, its lobes triangular-ovate, ¼ the length of the obovate or elliptic whitish or flesh-colored petals; capsule 3 lines broad, its sutures somewhat cobwebby in dehiscence.—Wooded mts., 1500 to 6000 ft., throughout Cal., widely dispersed but infrequent; n. to B. C. June-July.

6. **P. ásarifòlia** Michx. var. **incarnàta** Fer. Scapes 9 to 18 in. high, a single scaly bract borne at the middle; leaves thin, cordate to rounded at base, rounded at apex or rarely subacute, 1 to 3¼ in. long, the petioles as long; flowers nodding in a loose scaly-bracted raceme; corolla white or nearly so, drying rose-purple.—Pine woods: San Bernardino Mts. (8000 ft.); Sierra Nevada (4000 to 8000 ft.): North Coast Ranges (1000 to 4000 ft.)

4. ALLÓTROPA T. & G.

Saprophytic herb. Stems bright red with longitudinal white stripes in sharp contrast, densely clothed with scales at base and with scattered scales above. Flowers brownish-red in a dense spike-like raceme. Sepals 5. Petals none. Stamens 10, or at summit of spike 8; anthers short and thick, somewhat 2-lobed, apiculate at apex, turned inward and downward on the apex of the filament and thus pendulous, each cell opening by a chink on back which reaches from the base to the middle. Ovary globose, 5-celled; style short;

stigma peltate-capitate, shallowly 5-lobed. (Greek allos, different, and tropos, turned, the raceme not nodding as in Monotropa.)

1. **A. virgàta** T. & G. Sugar Stick. Plants 7 to 13 (or 18) in. high; raceme virgate, mostly 6 to 9 in. long; scales of the stem often bluish white; flowers 2½ to 3 lines long, on pedicels 1 line long; sepals rhomboidal or ovate, thin, whitish, shorter than the purple-black stamens; ovary dark red or purple-black, the style white.—Montane, under pines or firs, 6000 to 8000 ft., infrequent: Sierra Nevada; North Coast Ranges; n. to Wash.

5. MONÓTROPA L.

Glabrous waxy-white herbs which turn black on drying. Stems scape-like, scaly, springing in a cluster from a ball of matted roots and ending in a solitary nodding flower. Sepals 2 to 4, scale-like or bract-like, deciduous. Petals 5 or 6, oblong, dilated a little at apex, erect, tardily deciduous. Stamens twice as many as the petals; anthers somewhat reniform, opening at first by two transverse chinks, at length 2-valved, the valves almost equal and spreading. Ovary 10-grooved, 5-celled; style short, thick; stigma funnelform, naked, obscurely crenate. Seeds innumerable, minute. (Greek mono, one, and tropos, turned, the flower drooping.)

1. **M. uniflòra** L. Indian Pipe. Stem 4 to 7 in. high; petals saccate at base. —Dark damp woods, very rare in Cal.: Del Norte Co.; N. Am., Asia.

6. HYPÓPITYS Hill

White, yellowish or reddish saprophytic herbs with scaly simple stems arising from a ball-like cluster of matted fibrous roots. Raceme several to many-flowered, at first nodding, soon erect. Flowers yellowish-white or red, mostly 3 or 4-merous, the terminal usually 5-merous. Sepals 2 to 4. Petals 3, 4 or 5, distinct, bearing a gibbous nectary on each side. Stamens 6 to 10; filaments hairy; anthers reniform, the cells confluent, opening by 2 valves. Ovary 4 to 7-celled; style columnar, expanding at summit into an umbilicate stigma. Capsule ovate-globose, the placentae covered with innumerable minute seeds. (Greek hypo, beneath, and pitus, fir, on account of the habitat.)

Bracts and sepals mostly entire.....1. *H. lanuginosa.*
Bracts and sepals mostly fimbriate.....2. *H. fimbriata.*

1. **H. lanùginòsa** Nutt. Pine-sap. Stem fleshy white or yellowish red, minutely pubescent, 4 to 10 in. high; scales and bracts ovate-lanceolate, entire or slightly erose, imbricated below, scattered above; raceme rather dense; calyx and corolla hairy inside; style hairy; ovary 4 or 5-celled.—Forests, Siskiyou Co.; Ore. to B. C. and around the northern hemisphere.

2. **H. fimbriàta** Howell. Stem white-fleshy, turning reddish-brown, 3 to 11 in. high; bracts ovate or obovate-cuneate, these and the spatulate sepals with laciniate-fimbriate margins or merely erose; flowers white; sepals 2 and lateral or with a third one in front, or a fourth behind, all except the lateral hairy; petals 3 to 5, spatulate-oblong; ovary 6 to 7-celled, perhaps also 4 or 5-celled.—Coniferous or oak woods: Humboldt Co.; n. to Ore. June-July. Perhaps better understood as a var. of no. 1.

7. PTERÓSPORA Nutt. Pine Drops

Reddish brown saprophytic herb with a single tall scape arising from a thick ball of matted fibrous roots and ending above in a many-flowered raceme. Calyx deeply 5-parted, persistent, about ⅓ as long as the corolla. Corolla white, globular-urnshaped, with 5 short recurved lobes, withering-persistent. Stamens 10; anthers 2-awned on the back near the base, longitudinally dehiscent. Ovary 5-celled. Stigma 5-lobed. Capsule depressed-globose, 5-lobed. Seeds innumerable, broadly winged from the apex. (Greek pteron, a wing, and spora, a seed.)

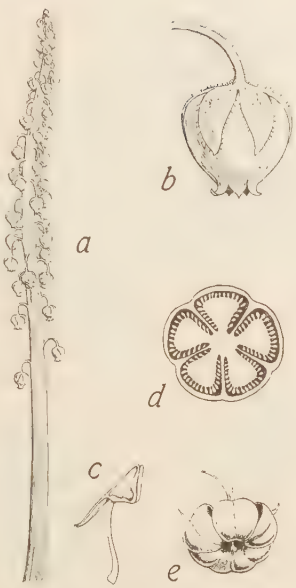
1. **P. andrómedéa** Nutt. Fig. 719. Stems stout, fleshy, 1 to 3 (or 4) ft. high, glandular-pubescent throughout, bearing numerous lanceolate or linear scales; raceme virgate, dense at first; pedicels slender, spreading, soon

recurved; corolla white, 2½ to 3½ lines long. —Rich humus beneath pines, 4000 to 7500 ft., common: San Jacinto, San Bernardino and San Gabriel mountains; Sierra Nevada; North Coast Ranges from Lake Co. to Siskiyou Co.; n. to B. C., e. to Pa. The plant dies after flowering.

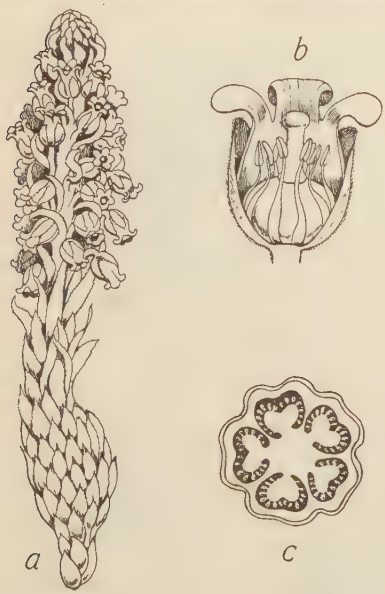
8. SARCÒDES Torr.

Bright red or crimson saprophytic herb with a single fleshy scaly stem arising from a thick ball of brittle roots and ending in a raceme of fleshy crimson flowers. Calyx of 5 distinct sepals, nearly equaling the corolla, glandular. Corolla red, campanulate, 5-lobed, glabrous. Stamens 10; anthers muticous but not awned, opening by terminal pores. Ovary low-conical, 5-celled, 10-lobed; style rather long; stigma capitate, somewhat 5-lobed. Capsule depressed, many-seeded, surrounded by the persistent calyx and corolla, the cells loculicidally dehiscent from top to bottom, the slit widest below and permitting the seed to fall out at the bottom. (Greek sarx, flesh, and oeides, resembling.)

1. **S. sanguínea** Torr. SNOW PLANT. Fig. 720. Stems 6 to 15 in. high; scales ovate, the upper strap-shaped; corolla 6 to 9 lines long. —Pine woods, 4000 to 8000 ft., common: Trinity and Siskiyou Cos.; Sierra Nevada from Lassen Co. to Tulare Co.; San Gabriel, San Bernardino, San Jacinto and Santa Rosa mountains; L. Cal.; w. Nev.; s. Ore. June-July.



719. Pterospora andromedea Nutt.; *a*, fl. stem x ½; *b*, fl. x 2; *c*, stamen x 4½; *d*, cross sect. of ovary x 5; *e*, capsule x 1⅓.

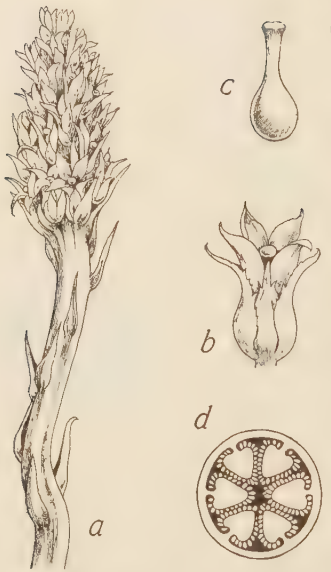


720. Sarcodes sanguinea Torr.; *a*, habit x ¼; *b*, long. sect. of fl. x 1½; *c*, cross sect. of ovary x 2.

9. NEWBÉRRYA Torr.

Saprophytic herb. Stem white, scaly, short and often subterranean. Inflorescence flesh-pink, capitate, dense, composed of short 2 to 5-flowered cymose spikelets. Sepals bract-like, 2 in the lateral flowers, mostly 4 in the terminal ones, hairy within, less so externally. Corolla tubular-campanulate (or slightly urn-shaped), very white-hairy within, slightly so outside, deeply 4-lobed in the lateral flowers, mostly 5 or 6-lobed on the terminal ones, withering-persistent. Stamens 6 to 11, mostly 8 or 10; filaments long-hairy at and above the middle; anther-cells 2, opening lengthwise. Ovary ovoid, 1-celled, hairy; style short, long-hairy, the hairs appearing as a sort of collar beneath the stigma; stigma strongly annular-umbilicate; placentae 4 to 10, sometimes with a placenta 2-lamellate. (Dr. J. S. Newberry, botanist of one of the Pacific Railroad surveys in 1855, and author of a memoir on the forest trees of northern California and Oregon.)

1. **N. congésta** Torr. Corolla 4 to 7



721. Pleuricospora fimbriolata Gray; *a*, fl. stem x ½; *b*, fl. x 1; *c*, pistil x 2; *d*, cross sect. of ovary x 4.

lines long, the linear or oblanceolate sepals as long or longer; stigma conspicuous, forming a yellow eye to the flower.—Very rarely seen, Redwood Belt: Monterey Co. to Mendocino and Humboldt Cos.; n. to Wash. (N. subterranea Eastw. Hemitomes congestum Gray. H. pumilum Greene.)

10. PLEURICÓSPORA Gray

Whitish or light brown saprophytic herb with imbricated scales. Stems simple, arising in clusters from a thick ball of fibres and terminating in a dense spike. Flower parts all glabrous. Sepals 4 or 5 (or 6), scale-like, the margins remotely fimbriate. Petals 4 or 5 (or to 8), distinct. Stamens 8 or 10; filaments filiform, glabrous. Ovary ovate, 1-celled, the 4 to 7 parietal placentae large, or 1 or 2 of them small. Style columnar; stigma umbilicate-capitate. Fruit a watery berry. (Greek pleuricos, at the side, and spora, seed, the placentae parietal.)

1. **P. fimbriolàta** Gray. Fig. 721. Stems 2 to 8 in. high; corolla whitish, 5 to 8 lines long; sepals involute, the petals nearly plane; stamens in 2 equal sets, the stamens of each set more approximate on one side than on the other; fruit whitish or at length blue-black. — Deep forest humus: Sierra Nevada, 4000 to 8300 ft., from Tulare Co. to Butte Co.; Santa Cruz Mts. to Siskiyou Co., 1500 to 4000 ft.

11. LÈDUM L. Labrador Tea

Evergreen shrubs with fragrant herbage. Leaves alternate, entire, the margin disposed to be revolute. Flowers white, small, in terminal umbel-like corymbs from large scaly buds. Pedicels slender. Sepals 5, almost distinct, very small. Petals 5, distinct, obovate, spreading. Stamens 5 to 10. Capsule 5-celled, dehiscing from the base upward, many-seeded; placentae borne on the summit of the axis of the fruit. (Greek Ledon, ancient name of the Cistus.)

722. Ledum glandulosum Nutt.; fl. branchlet x 1.

1. **L. glandulòsum** Nutt. Fig. 722. Low, 2 to 5 ft. high; leaves thickly clothing the stems, oblong, acute at each end, mucronate at apex, 1 to 2½ in. long, green and glabrous on both sides, or light-colored beneath with a gland-dotted felt; petals elliptic-ovate, 2½ to 3 lines long; stamens 10; filaments ciliate toward the base; capsule oval, 2 lines long.—Colonizing borders of wet meadows or marshy places: Sierra Nevada, 4000 to 10,000 ft.; along the coast, 20 to 500 ft., from the Santa Cruz Mts. to Pt. Reyes and Ft. Bragg; n. to Ore. and thence e. to the Rocky Mts. Poisonous to sheep.

12. RHODODÉNDRON L.

Ours shrubs with alternate entire leaves crowded on the flowering branches. Flowers in umbels or corymbs, from terminal buds with thin deciduous scales. Calyx very small. Corolla funnelform to campanulate, cleft, often somewhat

irregular. Stamens 5 or 10. Style filiform; stigma capitate or somewhat lobed. Fruit a septicidal 5-celled capsule, the valves separating from the columella. (Greek rhodos, rose, and dendron, a tree.)

Deciduous; flowers commonly white; stamens 5.....1. *R. occidentale.*
Evergreen; flowers rose-purple; stamens 10. 2. *R. californicum.*

1. **R. occidentàle** Gray. WESTERN AZALEA. Fig. 723. Loosely or widely branching shrub 3 to 8 or 14 ft. high; leaves thin, narrowly or broadly obovate, 1 to 4 in. long, ciliate, otherwise nearly glabrous; calyx 5-parted, its lobes ovate or oval, 1 line long; corolla white or sometimes pink, 1½ to 1⅞ in. long, 5-cleft, slightly irregular, the upper lobe with a large yellow splotch, the tube funnelform, glandular-viscid outside; stamens 5, exserted; ovary densely pubescent with whitish gland-tipped hairs. — Stream banks or moist flats, rarely on open slopes, rather common: Coast Ranges (excepting the inner ranges) from the Santa Cruz Mts. to Marin, Sonoma and Shasta Cos., 50 to 3500 ft.; Sierra Nevada, 3500 to 7500 ft.; San Jacinto, Palomar and Cuyamaca mountains, 5000 to 6000 ft. May-July. Feared by sheepmen as poisonous. Var. PALUDÒSUM Jepson n. var. Flowers pink to white and yellow; calyx-lobes linear-oblong, 4 to 5 lines long.—Sedgy bogs, Humboldt coast (Fortuna, Jepson 1916, type.)

723. Rhododendron occidentale Gray; *a*, fl. branchlet x ⅓; *b*, capsule x ⅔.

724. Rhododendron californicum Hook.; *a*, fl. branchlet x ⅓; *b*, fl. x ½; *c*, capsule x ⅔.

2. **R. califórnicum** Hook. CALIFORNIA ROSE BAY. Fig. 724. Rather closely erect shrub 4 to 8 ft. high, or in the northern Redwoods a small tree up to 26 ft. high; leaves coriaceous and evergreen, oblong or elliptic, shortly acute, green above, rusty or lighter beneath, 2½ to 5½ in. long; calyx 5-lobed, its lobes low, obtuse, ½ line long; corolla turbinate-campanulate, rose-purple, 1¼ in. long, its broad lobes undulate, the upper lobe greenish-dotted within; stamens 10, not exserted; ovary densely red-silky.—Along the coast: Malpaso Creek; Waddell Creek; Pescadero; Mt. Tamalpais; abundant on the Mendocino and Humboldt coasts; w. Siskiyou Co.; n. to Wash. Reported poisonous to sheep.

13. MENZIÈSIA Sm.

Shrubs with alternate deciduous leaves. Flowers greenish-purple, developed with the leaves from strigose-chaffy terminal buds and borne in clusters on nodding pedicels. Calyx small, flattish, bristly-ciliate, usually

4-lobed, rarely 5-lobed. Corolla cylindric-urnshaped, 4-toothed or -lobed. Stamens 8. Anthers opening by a terminal pore or chink. Style filiform; stigma 4-lobed. Capsule ovoid, woody, 4-celled, 4-valved, many-seeded. Seeds slender. (Archibald Menzies, surgeon and botanist of the Vancouver Expedition.)

1. **M. ferrugínea** Sm. RUSTYLEAF. Slender shrub 6 to 15 ft. high; leaves thin, obovate, acutish, serrulate, strigose above with scattered rusty hairs on the upper side, 2 to 3 in. long, shortly petioled; pedicels glandular-pubescent, 10 to 13 lines long; corolla 3 to 4 lines long; capsules 3½ lines long, on erect pedicels.—Humboldt Co. (Freshwater Creek and head of Prairie Creek); n. to Alas. June.

14. KÁLMIA L. AMERICAN LAUREL

Ours low subalpine or diminutive alpine shrubs with glabrous herbage. Leaves opposite, coriaceous, evergreen. Flowers in umbels terminating the branches. Calyx deeply 5-parted. Corolla saucer-shaped, 5 lobed, with 10 pouches below the lobes and sinuses. Stamens 10, each pouch of the corolla holding an anther. Ovary 5-celled, the placentae borne at the summit of the cells. Capsule septicidally 5-valved from above.—The expansion of the corolla curves the filaments outward and backward, so that irritation or jostling of the stamens or corolla, as by an insect, causes the elastic filaments to release the anthers with considerable violence, thus scattering the pollen. (Peter Kalm, early North American explorer, Knight of the Order of Vasa and a pupil of Linnaeus.)

725. Kalmia polifolia var. microphylla Rehder; fl. branchlet x 1.

1. **K. polifòlia** Wang. PALE LAUREL. Erect, 1 to 2 ft. high; leaves elliptic-oblong to oblong, shining green above, glaucous or whitish beneath, revolute-margined, ½ to 1 in. long; sepals ovate; corolla bright pink or rose-purple, 6 to 9 lines broad; valves of the capsule pouch-shaped, splitting half-way down the back but closed in front below, the opening above corresponding to a placenta; placentae persisting on the summit of the axis.—Modoc Co.; n. to Alas., e. to Newf. Var. MICROPHÝLLA Rehd. Alpine Laurel. Fig. 725. Two to 3 in. high; leaves often seemingly linear on account of the strongly revolute edges, 3 to 7 lines long; corolla 5 to 7 lines broad.—Edges of wet meadows or swamps, 7000 to 12,000 ft.: Sierra Nevada from Tulare Co. to Nevada Co., and n. to Mt. Shasta, thence w. to Trinity Summit; n. to B. C., e. to Col.

15. PHYLLÓDOCE Maxim.

Diminutive alpine heath-like shrubs. Leaves evergreen, alternate, crowded, linear, with revolute margins, articulated with the stem and leaving behind a raised scar when falling away. Flowers in ours rose-color, racemose-crowded at the summit of the branches and therefore appearing umbellate. Pedicels glandular, each with 2 bracts at base. Sepals commonly 5. Corolla open-campanulate, 5-lobed. Stamens 7 to 10; anthers opening by an oblique terminal chink. Capsule globose, septicidally 5-valved from the summit. (Greek Phullodoce, a sea nymph mentioned by Virgil.)

Stamens exserted; corolla 5-cleft to the middle.....1. *P. breweri.*
Stamens included; corolla merely 5-lobed.....2. *P. empetriformis.*

1. **P. brèweri** (Gray) Hel. RED HEATHER. Stems rigid, 4 to 12 in. high; leaves 3 to 7 lines long, smooth; sepals mostly glabrous; corolla deeply saucer-shaped or bowl-shaped, 4 to 6 lines broad, 5-cleft nearly or quite to the middle, the lobes recurving from the tip; stamens exserted; style exserted.—Alpine, 7000 to 12,000 ft.: San Bernardino Mts.; Sierra Nevada from Tulare Co. to Lassen Co., thence w. to Mt. Shasta and Marble Mt. July-Aug. (Bryanthus breweri Gray.)

2. **P. émpetrifórmis** (Sm.) Don. Stems 6 to 10 in. high; leaves roughish on the edges; sepals mostly ciliolate; corolla campanulate, 2 to 3 lines long, the lobes much shorter than the tube; stamens included; style included or exserted.—High mts. of our northern borders, 7500 to 9000 ft.: Marble Mt.; Mt. Shasta; n. to Alas., e. to Wyo.

16. **CASSÌOPE** Don

Diminutive alpine shrubs with heath-like stems. Leaves evergreen, opposite (in ours), densely imbricated, small, entire. Flowers solitary, nodding on slender naked peduncles. Sepals 4 or 5, ovate. Corolla broadly campanulate, in ours 5-lobed. Stamens 10 or 8; filaments subulate; anthers tipped with a pair of recurved awns. Capsule globose, 4 or 5-celled, loculicidal, the valves soon 2-cleft. (Cassiope, wife of Cepheus and mother of Andromeda.)

1. **C. mertènsiàna** Don. Fig. 726. Tufted, 2 to 12 in. high, the stems covered throughout with thick leaves crowded in 4 ranks; leaves ovate, keeled on the back, 1 line long; peduncles lateral; corolla white, 3 lines long.—Granite rocks and clefts, high montane, 8000 to 10,000 ft.: Sierra Nevada from Fresno Co. to Placer Co.; n. to Alas.

726. Cassiope mertensiana Don; fl. branchlet x 1.

17. **LEUCÓTHOE** Don

Shrubs with coriaceous alternate leaves. Flowers white, in terminal or subterminal racemes, thus forming a naked panicle. Bracts and bractlets in ours small, scarious or whitish. Sepals distinct. Corolla ovate, with a narrow opening. Stamens 10; anthers oblong, obtuse, awnless but with each cell 2-mucronate. Ovary 5-celled; stigma 5-lobed. Capsule somewhat depressed, loculicidal; placentae borne on the upper part of the central axis or columella. (Leucothoe, daughter of Orchamur, King of Babylon, and Eurynome.)

1. **L. davísiae** Torr. Two to 5 ft. high; leaves evergreen, oblong, obscurely serrulate or entire, 1 to 3 in. long; racemes erect, 2 to 4 in. long; flowers pendulous, 3 to 3½ lines long.—Springy ground, montane, 6000 to 8000 ft.: Poison Mdw., Sievel Mt., Madera Co.; Wawona road summit from Mariposa; Merced Grove; Frog Lake, Nevada Co.; Eureka, Nevada Co.; Brush Creek, Butte Co.; Whiskey Butte, Siskiyou Co.; Coffee Creek, Salmon Mts., Trinity Co.

18. **GAULTHÈRIA** L.

Shrubs or fruticulose plants. Leaves broad, evergreen, shining above. Flowers white or pink. Calyx 5-cleft. Corolla 5-toothed or -lobed. Stamens 10; filaments dilated at base. Ovary depressed, 5-lobed, 5-celled, seated on a thin narrow undulate-toothed disk; stigma entire. Calyx becoming fleshy and at length enclosing the pod, forming a berry-like fruit. (Dr. Gaultier, Canadian physician and botanist.)

Flowers in racemes; filaments hairy on back; anthers with a pair of spreading awns from the summit of each cell.....1. *G. shallon.*
Flowers solitary; filaments glabrous; anthers not awned.....2. *G. humifusa.*

1. **G. shállon** Pursh. SALAL. Fig. 727. Slender shrub with erect or spreading stems 1 to 6 ft. high; leaves ovate or orbicular, slightly cordate at base, finely serrate, 2 to 4 in. long; petioles 1 to 2 lines long; racemes axillary or terminal, 3 to 6 in. long, pubescent (as also calyx and corolla) with short glandular hairs; bracts scaly, ovate, concave, often reddish; pedicels declined, bearing 2 bractlets below the middle; calyx reddish; corolla white or pinkish, oval-urnshaped, 5-toothed at the narrow orifice, 4 to 5 lines long; fruit globose, black.—Woods along the coast, especially in the Redwood belt: Santa Inez Mts.; Santa Lucia Mts.; Santa Cruz Mts. to Del Norte Co.; n. to B. C. Mar.-May. In Mendocino and Humboldt Cos. commonly abundant and covering thickly the forest floor.

727. Gaultheria shallon Pursh; *a*, fl. branchlet x ⅓; *b*, long. sect. of fl. x 2; *c*, stamen x 4½; *d*, cross sect. of ovary x 4.

2. **G. humifùsa** (Graham) Rydb. Stems procumbent, 2 to 8 in. long, forming a loose mat; leaves orbicular or oval, 3 to 11 lines long; stems, pedicels and calyx sparingly pilose; flowers solitary and axillary, on short pedicels with 3 to 5 bractlets; corolla white, depressed-campanulate, 5-parted; anthers not awned, obscurely 4-pointed at apex; fruit scarlet.—High montane forests, rare in Cal.: Granite Basin, Kings River; Scales Diggings, Sierra Co.; head of Redwood Creek, Humboldt Co.; Kelsey trail near Preston Peak; n. to B. C., e. to Rocky Mts. (G. myrsinites Hook.)

19. ÁRBUTUS L. Arbute Tree

Evergreen trees or shrubs with glossy leathery leaves. Flowers in a terminal panicle of dense racemes. Calyx small, 5-parted. Corolla globular or ovate, 5-lobed at apex. Stamens twice as many as the corolla-lobes, included; filaments soft-hairy; anthers with a pair of reflexed awns on the back. Ovary on a hypogynous disk, 5 or rarely 4-celled. Fruit a many-seeded berry with granular surface. (Latin name of the Arbute tree under which, says Horace, idle men delight to lie.)

1. **A. menzièsii** Pursh. Madroño. Fig. 728. Widely branching tree 20 to 125 ft. high; bark polished, crimson or terra cotta, or on old trunks dark brown and fissured into small scales; leaves narrowly elliptic or ovatish, glabrous, dark green and polished above, glaucous beneath, entire, or on vigorous shoots, finely serrate, 3 to 6 in. long; flowers white; corolla 3 lines long, with 5 very small lobes recurving from the small opening, and 10 semi-transparent glands in a circle at base; berry somewhat depressed-globose, 4 to 5 lines in diameter, fleshy but rather dry, red or orange color.—Foothills and mts., 300 to 4000 ft.: local in S. Cal. (Palomar, San Bernardino, San Gabriel and Santa Inez mountains); Coast Ranges from Monterey Co. to Del Norte Co.; Sierra Nevada from Tuolumne Co. to Shasta Co.; n. to B. C.

728. Arbutus menziesii Pursh; *a*, fr. branchlet x ¼; *b*, long. sect. fl. x 1¼

20. CÓMAROSTÁPHYLIS Zucc.

Evergreen shrub or small tree with alternate coriaceous leaves. Flowers white, in structure like Arctostaphylos, borne in racemes. Racemes solitary or clustered, from terminal buds. Ovary 5-celled, one ovule in each cell. Fruit red, berry-like, consisting of a solid stone densely covered with pulpy clavate or somewhat obovoid granules attached at base; stone 3 to 5-celled. (Greek komaros, the Arbutus, and staphule, a grape, referring to the clusters of edible fruit.)

1. **C. divérsifòlia** Greene. Shrub, 6 to 15 or 20 ft. high; leaves oblong-ovate to ovate or linear-oblong, spinu-

lose-serrate, mostly acute at base and apex, glabrous, green and shining above, whitish-pubescent beneath, 1½ to 3 in. long; racemes 2 to 5 in. long; rachis, pedicels and calyx tomentose; pedicels 2 to 6 lines long; calyx-lobes subulate; ovary densely hairy; berry red, subglobose, 2 to 2½ lines long, often tipped with the persistent style.—Coast region, Santa Monica Mts. to w. San Diego Co.; Santa Cruz, Santa Rosa and Santa Catalina Isls.; s. to L. Cal.

21. ARCTOSTÁPHYLOS Adans. MANZANITA

Evergreen shrubs with very crooked branches, the bark dark red or chocolate-color, smooth and polished. Leaves entire (rarely serrate), more or less vertical by twisting of the petiole. Flowers white or pink, in a terminal usually subglobose nodding cluster or panicle composed of few to several short racemes. Flower parts usually in 5s. Bracts commonly scaly. Sepals distinct. Corolla urn-shaped. Stamens twice as many as the corolla-lobes; anthers with a pair of reflexed awns on the back; filaments more or less hairy, dilated toward the base. Ovary seated on a hypogynous disk, 4 to 10-celled, with one ovule in each cell, maturing into a dry brown berry-like fruit with an outer pulp covering several stony 1-seeded nutlets. Surface of the berry smooth, the pulp at first fleshy, at maturity usually mealy or powdery. Nutlets distinct, or irregularly united in 2s or 3s, or sometimes consolidated into a single stone.—Wood hard but brash, warping and cracking excessively in seasoning. (Greek arktos, a bear, and staphule, a grape; bears feed on the berries.)

A. LEAVES PLANE OR NEARLY SO, OFTEN MORE OR LESS VERTICAL.

1. Ovary glabrous (except in no.3); leaves and branchlets glabrous or essentially so.

Erect robust shrubs 4 to 8 (or 14) ft. high.
Pedicels glandular; foliage very white-glaucous.
Berry with solid stone; pedicels viscid-glandular, sometimes glandular-pubescent; S. Cal. and South Coast Ranges.....1. *A. glauca.*
Berry with separate nutlets; pedicels glandular-hairy; branchlets and peduncles very glaucous; Sierra Nevada foothills chiefly.
Ovary glabrous; branchlets and peduncles very glabrous.....2. *A. viscida.*
Ovary glandular hairy; branchlets and peduncles glandular-hairy.....3. *A. mariposa.*
Pedicels not glandular or only obscurely or minutely so; berry not glandular (except in A. elegans).
Panicles very dense; peduncles and rachises minutely glandular, not pubescent; leaves dark green; higher forest belt, chiefly Sierra Nevada.4. *A. patula.*
Panicles more open; peduncles and rachises not glandular.
Branches disposed to be erect and straightish; peduncles and rachises glabrous or nearly so; leaves bright green.
Berry not glandular; Napa Range n. to Lake and Mendocino Cos.....5. *A. stanfordiana.*
Berry all over glandular; Lake Co.....6. *A. elegans.*
Branches crooked, spreading widely.
Leaves abruptly acute, mucronate, less than 1 in. long; mts. of S. Cal..7. *A. pungens.*
Leaves obtuse or acute, more than 1 in. long; mts. of cent. and n. Cal.
Peduncles and rachises canescently puberulent; panicles drooping; leaves light green; North Coast Ranges and n. Sierra Nevada foothills.....8. *A. manzanita.*
Peduncles and rachises glabrous or minutely puberulent; panicles erect or only half-drooping; leaves pale or whitish; Sierra Nevada.....9. *A. pastillosa.*
Dwarf or procumbent or low shrubs; pedicels glabrous or nearly so.
High Sierra species; plants forming a rough mat.....10. *A. nevadensis.*
Coastal or seashore species.
Leaves ovate or obovate, shortly acute at apex, both sides alike...11. *A. hookeri.*
Leaves mostly obovate, rounded or obtuse at apex.
Leaves both sides alike; berry mostly pink or red.....12. *A. uva-ursi.*
Leaves green above, paler beneath; berry brown.....13. *A. pumila.*

2. Ovary pubescent; leaves and branchlets pubescent or usually so.

Bracts brown or herbaceous; Coast Ranges (except no. 15), mostly near the coast.
Nutlets distinct or united into sets of 2 or 3.
Calyx with entire sepals.
Leaves mostly 4 to 7 lines long; berry glabrous; nutlets thin-shelled.
Low or procumbent shrubs; apex of leaves plane.
Apex of leaves obtuse or bluntish; Mendocino coast.....14. *A. nummularia.*
Apex of leaves acute, mucronate; Amador Co. foothills.....15. *A. myrtifolia.*

Slender erect shrub; apex of leaves abruptly short-acute, curved or deflexed; cent. coast region.....16. *A. sensitiva.*
Leaves mostly 1 to 1½ (or 2) in. long; nutlets thick-shelled; berry minutely short-hairy.
Leaves rarely cordate, short-petioled.
Branchlets not hispid; ovary densely white hairy, not glandular..17. *A. canescens.*
Branchlets or some of them more or less hispid; ovary white-hairy.
Stems several from a heavy woody basal platform.
Main stems with smooth bark; ovary hairs glandular; berry glandular.....18. *A. glandulosa.*
Main stems with shreddy bark; ovary hairs not glandular; berry not glandular.....19. *A. tomentosa.*
Stems single, not swollen at the ground into a woody base; hairs not glandular; berry not glandular.....20. *A. columbiana.*
Leaves mostly cordate, thickly clothing the branchlets, sessile.....21. *A. andersonii.*
Calyx with fimbriate edge to sepals; Santa Barbara Isls.....22. *A. insularis.*
Nutlets united into a solid stone; Tehachapi Mts. to San Gabriel Mts..23. *A. parryana.*
Bracts pink, petal-like; stone solid; S. Cal.....24. *A. drupacea.*

B. LEAVES STRONGLY REVOLUTE, NOT AT ALL VERTICAL.

Stone solid; S. Cal. coast.....25. *A. bicolor.*

1. **A. gláuca** Lindl. GREAT-BERRIED MANZANITA. Shrub 6 to 8 ft. high, or almost arborescent and 15 ft. high with a trunk 6 to 13 in. in diameter; leaves glaucous and glabrous, roundish or elliptical to broadly ovate, obtuse or acute at apex, obtuse, truncate or subcordate at base, 1¼ to 1¾ in. long; petioles 3 to 7 lines long; panicle broader than high, frequently very compact; rachis glabrous, sometimes a little glaucous; pedicels glandular; flowers white, rather large; berry rather densely covered with minute glands and very viscid, globose, 5 to 8 lines broad; pulp scanty; stone solid, smooth. —Cismontane S. Cal., ranging n. to Monterey Co. and Mt. Diablo. Var. EREMÍCOLA Jepson. Leaves purple-veined; berry elliptic in outline.—Piñon Well Mts., n. Colorado Desert.

2. **A. víscida** Parry. WHITE-LEAF MANZANITA. Shrub 4 to 10 ft. high, with very striking contrast between the white foliage and deep red crooked branches; branchlets and peduncles glaucous and very glabrous, usually reddish, the rachis of the raceme or panicle glandular; leaves very white-glaucous, glabrous, elliptic, varying to orbicular or round-ovate, obtuse or abruptly acute, rounded at base, ¾ or 1 to 1½ (or 2) in. long; flowers in simple or forked racemes; pedicels 4 to 6 lines long, with short spreading glandular hairs; bracts small, ovate-lanceolate, acuminate; calyx-lobes reflexed over summit of pedicels; corolla light pink; berry deep red, globose, 3 to 4 lines broad, the surface very glandular, cohering in sticky masses when gathered, or often non-glandular; nutlets distinct or 2 or 3 united.—Foothills of the Sierra Nevada (often the only manzanita in the upper portion of the chaparral belt): Tulare Co.; Calaveras Co. to Butte Co.; and extending around the head of the Sacramento Valley into the inner North Coast Ranges and s. to the Napa Range. Remarkable for its white-glaucous branchlets and peduncles. The shrubs kill completely under chaparral fire and do not crown-sprout.

3. **A. maripòsa** Dudley. Shrub 4 to 8 ft. high with spreading branches and very white-glaucous foliage; branchlets and inflorescence glandular-pubescent or puberulent, the hairs mostly spreading; leaves glabrous or nearly so, very rigid, oval to elliptic, shortly acute or at least mucronulate, 1 to 1¾ in. long; panicle many-flowered, small, compact; pedicels with glandular hairs; ovary glandular-hairy; berry bright red, glandular-viscid, sometimes covered with minute stipitate glands.—Sierra Nevada, higher foothill region from Tuolumne Co. s to Fresno Co. Very closely allied to no. 2 and sometimes difficult to distinguish from it. Var. BIVÍSA Jepson. Leaves dark green, 1½ to 2½ in. long; branchlets glandular-hairy and somewhat dusky; berry whitish or somewhat lucent.—Hetch-Hetchy to Wawona.

4. **A. pátula** Greene. GREEN MANZANITA. Widely or diffusely branching shrub 3 to 5 (or 8) ft. high; peduncles and rachis of inflorescence, and commonly the branchlets, minutely glandular-puberulent; leaves bright green, glabrous, typically orbicular or broadly elliptic, mostly rounded at apex, or obscurely acutish, rounded or subcordate at base, 1 to 1½ (or 2¼) in. long;

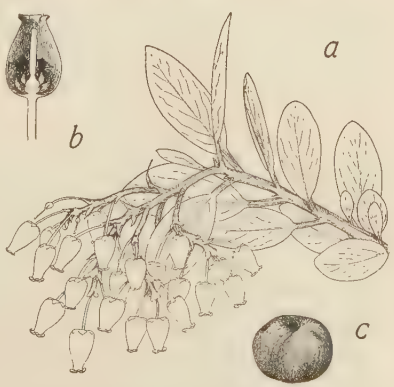
panicle corymbose, very dense; bracts ovate, abruptly attenuate; pedicels glabrous, 2 to 3 lines long; sepal tips white-scarious; corolla deep pink; berry commonly dark or black when half-grown, when mature globose or commonly depressed, glabrous, often very hard, 4 to 5 lines broad; nutlets smooth on sides and back, not channeled.—Open pine woods, 4500 to 9000 ft. or 2500 to 5000 ft. at the north: Sierra Nevada from Shasta Co. to Tulare Co.; high North Coast Ranges from the Siskiyou Mts. and Mt. Shasta s. to Mt. Hull; San Gabriel, San Bernardino and San Jacinto mountains; w. Nev.; Ore. It is the dominant and usually the only species in its area in the Sierra Nevada. The stem forms a globose or tuber-like body at or near the surface of the ground, which crown-sprouts after fire. The panicle is commonly broad and flattish and its glandular-puberulent rachis is often dark, while the bracts are commonly ovate-attenuate. The berries when three-fourths grown are sometimes rather hard with the nutlets and pulp as if concreted.

5. **A. stánfordiàna** Parry. Erect shrub 3 to 6 ft. high with slender dark red stems; leaves glabrous, bright green on both faces, narrowly ovate to oblanceolate, most frequently acute at both ends, 1 to 1½ in. long, very erect; branchlets, peduncles and rachis glabrous or obscurely or minutely glandular-puberulent; flowers light pink to lilac; corolla 2 to 3 lines long, very frequently with an obscure constriction just below the middle; berry very small, usually much depressed and commonly unsymmetrical or irregular, or sometimes globose, glabrous, usually a bright apple-red when first mature, about 1½ lines high and twice as broad; nutlets broader than high.—Mountain summits and ridges, Mendocino and Lake Cos., s. to the Napa Range. Apr.-June. The plant body is killed outright under chaparral fire.

6. **A. élegans** Jepson. Similar to no. 5; inflorescence nearly glabrous; flowers unknown; berry all over minutely stipitate-glandular.—Mt. Konocti, Lake Co.

7. **A. púngens** H.B.K. Shrub (2 or) 3 to 8 ft. high; branchlets canescent or white-tomentulose; leaves oblong to elliptic, abruptly or somewhat obscurely short-acute, mucronate, finely pubescent or minutely tomentulose, eventually glabrate or often rather glossy, 8 to 10 lines (rarely to 1¼ in.) long; pedicels glabrous; panicles small; berries usually somewhat depressed-globose and 3 to 4 lines broad, but variable in size and sometimes eccentric in shape, glabrous, dark-brown or terra-cotta, shining.—San Bernardino and San Jacinto mountains, 5000 to 6000 ft., n. in the inner Coast Ranges to San Benito Co., thence to Mt. Tamalpais, about 1600 to 2200 ft.; e. to Ariz., s. to Mex. When decumbent branches lie along the ground they root on the under side.

8. **A. manzanita** Parry. Parry Manzanita. Fig. 729. Shrub 6 to 12 ft. high, commonly very erect, sometimes widely branched from the base with long straggling crooked branches, sometimes becoming almost elephantine in its proportions and up to 22 ft. high; branchlets, peduncles, and rachis finely and somewhat canescently puberulent; pedicels glabrous; leaves pale green, thick, glabrous or minutely puberulent, elliptic or oblong, acute or subacute at apex, acute or obtuse at base, 1 to 1½ in. long; panicles drooping; flowers white, sometimes pink-tinged; bracts triangular-acute, small and dry; berry dull white in early summer, becoming deep reddish brown in late summer and autumn, smooth and glabrous, 4 to 5 lines in diameter; nutlets irregularly coalescent or separate, keeled or ridged and roughened on back, and often with 2 small lateral ridges.—North Coast Ranges (only or mostly



729. Arctostaphylos manzanita Parry; fl. branchlet x ½; *b*, long. sect. fl. x 1¼; *c*, fr. x ¾.

the middle and inner ranges), n. to Tehama Co., thence s. in the Sierra Nevada foothills to Tuolumne Co.; also on Mt. Diablo. The shrubs kill completely under chaparral fire and do not sprout from the root-crown.

9. **A. pastillòsa** Jepson. Shrub 3 to 6 ft. high; leaves and pedicels glabrous, the peduncles and rachises glabrous or minutely puberulent; foliage light-green; leaves elliptic-oblong, or -obovate, varying to oblong-lanceolate and somewhat willow-like, mostly acute, glabrous and glaucous, 1 to 1¾ or 2½ in. long; pedicels glabrous; panicles loose, erect or only half-drooping; ovary depressed, roughened but glabrous; berry elevated-globose or globose, dull white or later light brown, 4 to 6 or 8 lines broad; nutlets 4 or 5, or sometimes coalescing into one channeled or ribbed stone, the stone forming tardily.—Sierra Nevada, higher foothills, 2500 to 4500 ft., chiefly in a belt between A. viscida and A. patula.

10. **A. nevadénsis** Gray. PINE-MAT MANZANITA. Plants gregarious and roughly carpeting the forest floor, the main stems creeping or trailing, rooting, the erect branches 3 to 6 or 9 in. high; leaves obovate or oblong-oblanceolate, obtuse and mucronate, or abruptly acute, glabrous or minutely puberulent, reticulate with dark veins, 7 to 12 lines long; pedicels glabrous, 1 to 2 lines long; berry dark carmine, smooth, glabrous, 2 to 3 lines in diameter.—Open pine woods, 7000 to 9000 ft.: Sierra Nevada from Tulare Co. to Shasta Co.; n. Lake Co. to Siskiyou Co.

11. **A. hoókeri** Don. Procumbent or low shrub ½ to 2 ft. high; branchlets and peduncles puberulent or minutely canescent; leaves bright green, shining, thinnish, glabrous or nearly so, ovate or elliptic, shortly acute, mucronate, 7 to 12 lines long; flower-clusters small; pedicels glabrous; corolla 1½ lines long; berry globose or depressed, glabrous, 2 to 2½ lines broad.—Forming small colonies on sand-dunes or in open woods near the coast: San Francisco; Pajaro Hills; Monterey; San Simeon. Mar.

12. **A. uva-úrsi** Spreng. RED BEAR-BERRY. SAND-BERRY. Stems several, trailing, prostrate or buried beneath the sand (all from a single main root), giving rise to erect branching stems 4 to 6 in. high; bark dark brown or somewhat reddish, becoming roughish; leaves oval or obovate, rounded at apex, rarely retuse or subacute, often reticulate-veiny, puberulent or nearly glabrous, especially in age, ½ to 1 in. long; corolla ovoid, white or pinkish, 2½ to 3 lines long; berry typically brilliant red or pink, smooth and glabrous, 3 to 4½ lines in diameter; nutlets 1 or sometimes 3-nerved on the back, obscurely roughened or reticulate on the sides.—Sand-dunes along the ocean shore: Mendocino Co.; Humboldt Bay; n. to B. C. and Alas., thence round the earth in northern regions.

13. **A. pùmila** Nutt. Stems prostrate with ascending branches 4 to 8 in. high, forming somewhat coarse or rough mats 2 to 5 ft. broad; branchlets and leaves finely pubescent or downy, or the leaves above quite glabrate; leaves dull green, obovate, acutish, 5 to 9 lines long; pedicels nearly glabrous; corolla 1½ lines long; ovary somewhat 5-lobed, seated in a saucer-shaped disk; berries reddish or red-brown, globose or globose-oblong, smooth, glabrous, 2 to 3 lines in diameter.—Sand hills and mesas c. of Monterey near the shores of Monterey Bay.

14. **A. nummulária** Gray. Dwarf bush ½ to 1 ft. high, the stems ascending or diffuse; branchlets pilose-pubescent; leaves thickly clothing the branches, elliptic to ovate or oblong, glossy, veiny below, glabrous, or the margins ciliate, 4 to 7 (or 9) lines long, on petioles ½ to 1 line long; corolla white, 1 to 2 lines long.—Mendocino coastal plain.

15. **A. myrtifòlia** Parry. Low diffuse shrub ¾ to 1¼ ft. high, the decumbent or spreading stems vertically thickened and ribbon-like, mostly ¾ to 1½ in. wide and 2 to 5 lines thick, much contorted or twisted; bark of branchlets shreddy; leaves narrowly ovate, sometimes elliptic or oval, mostly obtuse at base, acute (or rarely obtuse) and mucronate at apex, 3 to 6 (or 9) lines long: otherwise like no. 14.—Sierra Nevada foothills in Amador Co. Feb. (A. nummularia var. myrtifolia Jepson.)

16. **A. sensitìva** Jepson. Fig. 730. Erect shrub 2 to 5 ft. high; branchlets and petioles puberulent and bristly-hirsute; leaves roundish, abruptly acute

or apiculate, finely reticulate-veiny beneath, nearly glabrous or sparingly bristly-ciliate, 5 to 7 (or 10) lines long, on petioles ½ to 1 line long; flowers 2 lines long; ovary pubescent; berry oblong, 2 lines long.—Mt. Tamalpais; Santa Cruz Mts.; distribution restricted but locally abundant. The shrubs are killed outright by chaparral fires.

17. **A. canéscens** Eastw. Shrub 3 to 6 ft. high; leaves ovate, rounded at apex or obscurely acute, ¾ to 3 in. long; branchlets, peduncles and leaves minutely and closely white-pubescent or canescent; pedicels more or less densely short-hairy and somewhat glandular, 2 to 4 lines long; bracts lanceolate, small, or sometimes large (3 to 6 lines long); ovary densely woolly; berry depressed-globose, 4 lines broad, faintly pubescent with very short spreading hairs.—Humboldt Co. s. to the Santa Cruz and Santa Lucia mountains, and far s. to the San Gabriel Mts. Commonly not in the immediate vicinity of the coast, nor reported thus far from the inner Coast Ranges. This shrub forms heavy root-crowns, from which new shoots arise after chaparral fires.

18. **A. glandulòsa** Eastw. EASTWOOD MANZANITA. Small or medium-sized shrub 2 to 3 (or 7) ft. high with many stems arising from a widely spreading root-crown; branchlets, peduncles and pedicels with a dusky more or less glandular indument or tomentum, the branchlets bearing also scattered and usually short bristles which are more or less glandular; leaves ovate to elliptic or oblong, mostly acute, rounded or subcordate at base, dark or yellowish green and often somewhat glandular, most commonly glabrous or apparently so, or sometimes with a fine pubescence, 1 to 1¾ in. long; pedicels glandular-hairy, the hairs not dense, often scattered; flowers in rather small compact clusters, white or pinkish; bracts lanceolate, the lower foliaceous; anther awns red; ovary hairy with glandular hairs, usually densely so; berry globose or more commonly depressed, glabrate or under a lens usually showing very short very scattered white hairs. — On broken sandstone: San Diego Co. and San Gabriel Mts., n. to the Oakland hills and Marin and Mendocino Cos. The most abundant species on the e. and s. slopes of Mt. Tamalpais. At other stations it is commonly less or scarcely at all glandular. The root-crown develops broad woody platforms, from which numerous shoots arise after chaparral fires. Var. VIRGÀTA Jepson. Leaves thin, somewhat willow-like, ovate to broadly lanceolate, mostly acute, serrulate or rough-edged, 1½ to 2 in. long.—Mt. Tamalpais n. to Tomales Bay.

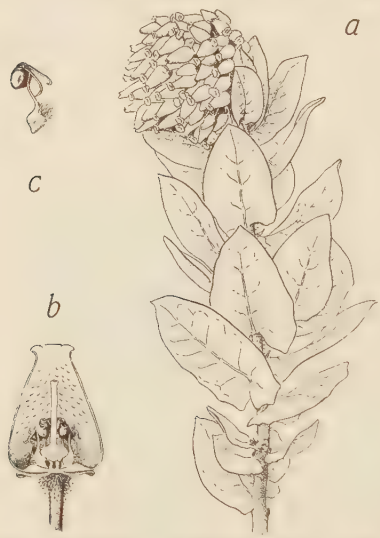
730. Arctostaphylos sensitiva Jepson; fl. branchlet x ⅔.

19. **A. tomentòsa** (Pursh) Lindl. Shrub 3 to 4 ft. high, the erect stems several or many from a broad woody root-crown; branchlets pubescent and hirsute; leaves oblong-ovate, mostly acute, mostly truncatish at base, green and glabrous above, a fine tomentum or close felt-like pubescence beneath, 1 to 1½ in. long; berry depressed-globose, 4 lines broad.—Low hills near the coast, Santa Cruz Co. to Monterey Co. (A. vestita Eastw. A. glandulosa var. vestita Jepson.) It apparently intergrades to A. glandulosa. The stems form thick woody root-crowns at the surface of the ground, from which crown-sprouts arise after fires. Var. CRASSIFÒLIA Jepson n. comb. Leaves elliptic, thick, 8 to 12 lines long.—San Diego coast. (A. glandulosa var. crassifolia Jepson.)

20. **A. columbiàna** Piper. HAIRY MANZANITA. Shrub 4 to 8 ft. high; branchlets very leafy; branchlets and petioles with two kinds of pubescence, long spreading bristly hairs arising from a fine tomentum, usually glandular; leaves sparingly pubescent or nearly glabrous, green or pale, ovate

to narrowly or broadly oblong, acute, obtuse to subcordate at base, entire or rarely spinulose-serrulate, 1 to 2 in. long, typically on very short petioles; bracts linear-lanceolate, the lower or all foliaceous, ¼ to 1 in. long; pedicels glandular-puberulent; flowers white, in compact clusters; berry depressed, 3 to 4 lines in diameter, minutely and sparingly white-hairy under a lens; nutlets distinct or more or less united.—Immediate neighborhood of the coast from Marin Co. to Humboldt Co.; n. to Wash. Extending s. to the Santa Cruz Mts. and San Luis Obispo Co., though apparently not in typical form. (A. tomentosa of Cal. auth. in small part.) The shrubs are killed completely by chaparral fires and never crown-sprout.

21. **A. andersònii** Gray. Fig. 731. Four to 8 (or 14) ft. high; branchlets with copious straight spreading hairs or bristles and with glandular indument; leaves crowded or almost imbricated on the branchlets, oblong or ovate, cordate at base or even auriculate, serrulate below the middle, puberulent or densely tomentulose, or becoming glabrous, 1 to 2½ in. long, commonly sessile, or sometimes with a petiole 1 to 2 or 3 lines long; bracts mostly foliaceous, 2 to 6 lines long; pedicels glandular-puberulent; corolla 3 lines long, truncatish at base; filaments glabrous; anther awns white; berry viscid-pubescent.—Antioch and Mt. Diablo to the Oakland Hills, Santa Cruz Mts. and Santa Lucia Mts. The main stem or trunk does not thicken at the ground, has not the capacity to crown-sprout, and in consequence the shrubs are killed outright by chaparral fires. Var. AURICULÀTA Jepson. Leaves usually canescent.—Mt. Diablo. Var. PECHOÉNSIS Jepson. Pedicels mostly glabrous.—San Luis Obispo Co.



731. Arctostaphylos andersonii Gray; *a*, fl. branchlet x 1½; *b*, long. sect. fl. x 2; *c*, stamen x 3.

22. **A. insulàris** Greene. Shrub 4 to 7 ft. high; branchlets glandular-puberulent and with short spreading glandular bristles; leaves ovate, bright green, nearly glabrous, ¾ to 2 in. long; peduncles and rachises puberulent, the pedicels not puberulent but rather densely clothed with spreading glandular hairs; flowers in a large panicle of elongated racemes, leafy-bracteate at base; sepals with fimbriate margins; corolla white; berry yellowish-brown, nearly glabrous, 3 to 6 lines broad, 2 to 3 lines high.—Santa Cruz and Santa Rosa Isls.

23. **A. parryàna** Lemmon. Shrub 3 to 5 ft. high; leaves ovate to elliptic, thickish, minutely purple-veined, and microscopically glandular, ¾ to 1⅛ in. long; branchlets and rachis canescently puberulent; bractlets deltoid-acute, the upper half deciduous; flowers not seen; pedicels glabrous; berry glabrous or nearly so, the stone solid, obscurely about 6-ridged or -angled.—Tehachapi Mts. and s. to the San Gabriel Mts.

24. **A. drupàcea** Mebr. Diffuse shrub 3 to 9 (or 15) ft. high; leaves elliptic, obtuse but abruptly mucronate, glaucous, minutely pubescent or subglabrous, 1¼ to 2¼ in. long; branchlets and inflorescence glandular short-pilose and pubescent; pedicels and bracts pink; pedicels 6 to 7 lines long; bracts membranous, lanceolate, 2 to 4 lines long, deciduous; sepals whitish, glandular-ciliate; berry red, oval, 3 lines long, the surface rugose and glandular short-hairy; stone solid.—Mts. and mesas of S. Cal. from the San Bernardino Mts. to the Cuyamaca Mts., 2000 to 7500 ft.; s. to L. Cal. (A. pringlei var. drupacea Parry.)

25. **A. bìcolor** (Nutt.) Gray. Shrub 3 to 6 (or 10) ft. high; leaves coriaceous, brittle, oblong or elliptic, tapering to base and apex, tending to be

revolute, dark green, shining and glabrous above, white-tomentose or felt-like beneath, 1 to 2½ in. long; pedicels and calyx at first densely tomentose; calyx dark red; corolla rose-color, 4 lines long; ovary a little hairy at summit; berry reddish, eventually with smooth highly polished dark red or almost black surface, 3 to 3½ lines broad; style-base persistent as a sort of short beak or papilla; stone solid, smooth.—W. San Diego Co.; Santa Catalina Isl.; L. Cal. (A. clevelandii Gray. Xylococcus bicolor Nutt.)

22. VACCÍNIUM L.

Shrubs or bushes, or on high mountain peaks or ridges, dwarfish or depressed woody plants. Leaves alternate. Flowers small (1 to 3 lines long). Calyx-tube adnate to the ovary, the limb 5-parted or -lobed, or entire. Corolla globular or urn-shaped to oblong-cylindric, 5 (or 4)-toothed. Stamens 10 (or 8); anthers (except in V. ovatum) bearing on the back two upwardly curved awns, each cell prolonged at apex into a tube-like appendage opening at the tip by a pore. Ovary 4 or 5-celled, the cells several to many-seeded. Fruit a berry, crowned with the vestiges of the calyx-teeth. (Classical Latin name of the bilberry.)

Evergreen; flowers in racemes; filaments hairy; anthers awnless.—Subgenus VITIS-IDAEA.
1. *V. ovatum.*

Deciduous; flowers solitary (sometimes 2 in a cluster in no. 2); filaments glabrous; anthers awned.—Subgenus EUVACCINIUM.

Calyx 5-lobed or -parted; leaves entire, only slightly veiny.

Branchlets not angled; berry blue or black, with a bloom; Sierra Nevada.....
2. *V. occidentale.*

Branchlets strongly angled; berry red; Redwood region.....3. *V. parvifolium.*

Calyx entire, as if truncate; leaves serrulate, reticulate-veiny.

Plants 2 to 4 ft. high; leaves 1 to 2 in. long; berry black (or at first red).....
4. *V. membranaceum.*

Plants low or dwarfish; leaves less than 1 in. long.

Branches sharply angled; berry red.....5. *V. myrtillus.*

Branches not angled; berry black.....6. *V. caespitosum.*

1. **V. ovàtum** Pursh. CALIFORNIA HUCKLEBERRY. Fig. 732. Erect evergreen shrub 4 to 8 ft. high; leaves coriaceous, shining above, oblong-ovate, serrate, ½ to 1¼ in. long, short-petioled; racemes 4 to 9-flowered, shorter than the leaves; pedicels 2 to 3 lines long; corolla pink, broadly bell-shaped, 3 to 3½ lines long; berry black, without bloom, globose-ovoid, 3 to 4 lines long.—N. slopes of hills near the coast: Purisima Hills, Santa Barbara Co.; Monterey Co. to Del Norte Co.; n. to B. C. Often the dominant under-shrub in extensive areas in the Redwood region. Var. SAPORÒSUM Jepson n. var. Berry glaucous.—Mendocino coast (Gualala, Robt. Brandt, type). The berry ripens earlier than in the species and has a better flavor.

732. Vaccinium ovatum Pursh; fr. branchlet x ¾.

2. **V. occidentàle** Gray. WESTERN BLUEBERRY. Fig. 733. Low shrub (1½ to 2 ft. high), with stoutish stems and numerous clustered and erect branchlets; leaves obovate or obovate-oblong, glaucescent on the under surface, entire, ½ to ¾ in. long; pedicels 1 to 4 lines long; flowers solitary or in clusters of 2; calyx 5-parted; corolla white, oblong-cylindric, 2 lines long, mostly 4-toothed; berry blue-black with a bloom, elliptic to oblong, 2½ to 4 lines in diameter; pedicel pendulous.—Swamps, 5000 to 8000 ft.: Sierra Nevada from Mariposa Co. to Siskiyou and Modoc Cos.; n. to Wash., e. to Utah.

3. **V. parvifòlium** Sm. RED BILBERRY. Shrub, 3 to 12 or 18 ft. high; branches and branchlets slender, very sharply angled, green, articulated; leaves thin, mostly oval, pale beneath, entire, 5 to 8 or 12 lines long; pedicels

733. Vaccinum occidentale Gray; *a*, fr. branchlet x ½; *b*, fl. x 3; *c*, fr. x 2.

2 to 4 lines long, deflexed in fruit or sometimes curved; calyx slightly 5-lobed; corolla globular, greenish; berry bright red, 3 to 4 lines in diameter, pleasant flavored. — Redwood region from the Santa Cruz Mts. to Humboldt Co.; Sierra Nevada, 4500 ft., from Mariposa Co. to Shasta Co. but rare; n. to Alas.

4. **V. membranáceum** Dougl. THIN-LEAF HUCKLEBERRY. Shrub 1 to 2½ ft. high, with widely spreading branches; branchlets slightly angled, those of the season bearing 3 to 5 (not crowded) leaves; leaves ovate or obovate to oval, mostly acute or acuminate, finely serrulate, membranous, both sides nearly alike, reticulate-veiny, 1 to 1½ (or 2) in. long; pedicels 3 to 5 lines long; calyx entire; corolla depressed-globose, greenish-white, 2 lines broad; pedicels erect in fruit; berry black (or garnet color, at least at first). — Montane, 5000 to 6000 ft.: Humboldt and Siskiyou Cos.; n. to B. C.

5. **V. myrtíllus** L. Stems freely branched, 3 to 10 in. high; branchlets angled, green, rather straight and disposed to be somewhat fastigiate; leaves obovate to ovate, ½ to ¾ in. long, serrulate or almost entire; pedicels very short, 1 line or less long; calyx-limb entire; corolla ovoid or subglobose, its lobes more or less erosulate; berry red.—Montane, 7000 ft.: Marble Mt., Siskiyou Co. (rare in Cal.); n. to Alas. June. Var. MICROPHÝLLUM Hook. Diminutive form; leaves 2 to 4 lines long; corolla 1 line long.—Sierra Nevada acc. Syn. Fl.

6. **V. caespitòsum** Michx. DWARF BILBERRY. Dwarfish, depressed, 2 to 4 (or 9) in. high; branchlets not angled; leaves obovate, mostly acute, usually cuneate at base, finely serrulate, ½ to ¾ (or 1) in. long; pedicels 1 line long or less; calyx rim a wavy border or entire; corolla pendulous, pink or white, ovoid, mostly 5-toothed; berry blue with a bloom, globose, 2½ to 3½ lines in diameter, on a curved pedicel.—Sierra Nevada, 6500 to 11,600 ft., from Tulare Co. to Lassen Co.; North Coast Ranges, 100 to 7000 ft., from Humboldt Co. to Mt. Shasta and w. Siskiyou Co.; n. to Alas., e. to Col. and N. Eng.

EMPETRÀCEAE. CROWBERRY FAMILY

Small evergreen shrubs. Leaves linear with a deep groove on the under side. Flowers dioecious, 3-merous. Ovary superior, 6 to 9-celled; ovules erect. Fruit a drupe.

1. ÉMPETRUM L.

Flowers inconspicuous, solitary in the axils, scaly-bracted. Sepals and petals mostly 3. Staminate flower with 3 stamens. Pistillate flowers with the stigma 6 to 9-parted into radiating lobes. Drupe black, berry-like, containing 6 to 9 nutlets. (Greek en, upon, and petros, a rock.)

1. **E. nìgrum** L. BLACK CROWBERRY. Stems 6 to 15 in. long, procumbent, with numerous branchlets, crowded with leaves, forming dense beds; leaves 1½ to 2½ lines long; drupe 3 to 4 lines long.—Sea-shore, Crescent City, Del Norte Co.; Ore. to arctic Am. and N. Eng.; Eur., Asia.

PRIMULÀCEAE. Primrose Family

Herbs with simple undivided leaves. Flowers perfect, regular and symmetrical, 4 to 8-merous, commonly 5-merous, axillary and solitary, or in terminal racemes or umbels. Stamens opposite the lobes of the corolla and inserted on its tube at base. Ovary 1-celled, with a single style and stigma, superior, except in Samolus, where it is attached to the base of the calyx; ovules on a free central placenta. Fruit a capsule.

Ovary superior (wholly free); flowers not in racemes.
  Stems scape-like, the leaves all basal; flowers in umbels.
    Corolla-lobes reflexed; stamen filaments monadelphous.....1. Dodecatheon.
    Corolla-lobes erect or spreading; stamen filaments distinct (as in all the following).
      Flowers large; corolla open at the throat, its lobes emarginate.....
      2. Primula.
      Flowers very small; corolla constricted at the throat, its lobes entire.....
      3. Androsace.
  Stems leafy; flowers axillary and solitary (or in no. 4 often seemingly clustered).
    Stems with the leaves in a single whorl at summit.....4. Trientalis.
    Stems leafy throughout.
      Leaves opposite.
        Corolla none.....5. Glaux.
        Corolla present, red.....6. Anagallis.
      Leaves alternate; corolla pinkish, minute.....7. Centunculus.
Ovary adnate to base of the calyx; flowers in racemes.....8. Samolus.

1. DODECÀTHEON L. Shooting Star

Low perennial herbs with basal leaves and a naked scape bearing an umbel of few or many flowers. Corolla 5-parted, with very short tube and dilated thickened throat, the long and narrow divisions reflexed in flower (as also the calyx-lobes). Stamens on the throat of the corolla; filaments short and flat, monadelphous, but at length separable above. Style filiform, exserted. Fruit a capsule with columnar placenta, surrounded at base by the now erect calyx. (Greek dodeka, 12, and theos, god, the Primrose being under the care of the deities. Singular flowers similar to those of the cultivated Cyclamen.)

Filaments distinct to the base.
  Capsule elliptic to broadly oblong, valvate from the very apex; high montane or alpine species.
    Herbage wholly glabrous; leaves 1 to 4 in. long; style not glandular.....
    1. D. *alpinum*.
    Stems and pedicels minutely glandular; leaves mostly 6 to 14 in. long; style usually glandular towards the base.....2. *D. jeffreyi*.
  Capsule circumscissile just around the enlarged stylar base; capsule cylindric.....
  3. *D. glastifolium*.
Filaments united into a short tube; capsule circumscissile at the apex, valvate only below this lid; lowland or foothill species.
  Modoc region; herbage wholly glabrous.....4. *D. conjugens*.
  Cismontane Cal.
    Root-crown without rice-grain bulblets at flowering time.
      Scapes and pedicels minutely glandular; anthers 2 lines long, the connectives strongly rugose.....5. *D. clevelandii*.
      Herbage wholly glabrous; anthers 1 line long, the connectives delicately rugulose.....6. *D. patulum*.
    Root-crown with rice-grain bulblets; herbage glabrous, the summit of the scape and the pedicels rarely microscopically glandular....7. *D. hendersonii*.

1. **D. alpinum** Greene. Alpine Shooting Star. Fig. 734. Scapes slender, 3 to 13 in. high; leaves narrowly spatulate or linear-oblanceolate, 1 to 4 (or 5) in. long; flowers mostly 4-merous; petals purple, the base whitish with a yellow zone edged beneath by a purple band; anthers 3 to 4 lines long; capsule exceeding the calyx, valvate from the very apex.—High montane, 7000 to 10,000 ft.: San Bernardino and San Jacinto mountains; Sierra Nevada; high North Coast Ranges from n. Humboldt Co. to Siskiyou Co.; n. to Ore. July.

2. **D. jéffreyi** Moore. Sierra Shooting Star. Scapes 12 to 21 in. high; leaves oblong-oblanceolate, gradually narrowed below to a winged petiole, mostly 4 or 6 to 15 in. long; peduncles, pedicels and calyx short-pubescent and somewhat viscid-glandular; flowers mostly 4-merous; corolla 8 to 12 lines long, the petals pink-crimson, a yellow zone at base edged below by a purple band; anthers 4 lines long; capsule broadly oblong; shorter than, rarely exceeding the calyx, valvate-dehiscent from very apex, or from a

734. Dodecatheon alpinum Greene; *a*, base of plant x ½; *b*, fl. stem x ½; *c*, stamen circle with exserted style x 2; *d*, long. sect. of ovary x 2.

circle just below the enlarged base of the style.—High montane, 8000 to 10,000 ft.: San Bernardino and San Jacinto mountains; Sierra Nevada; White Mts.; North Coast Ranges from the Yollo Bolly Mts. to Siskiyou Co. The leaves are somewhat suggestive of those of Rumex occidentalis. Var. TETRÁNDRUM Jepson n. comb. Habit of the species but all the parts glabrous; flowers 4 (or 5)-merous.—Salmon Mts.; Lassen Creek, Modoc Co.; n. to Wash. (D. tetrandrum Suksdorf.) Var. RÉDOLENS Hall. Herbage odorous; flowers mostly 5-merous; corolla not so closely reflexed, covering the base of the anthers, purple band at base absent.—San Jacinto Mts.; Sierra Nevada from Tulare Co. to Mariposa Co.; w. Nev.

3. **D. glastifòlium** Greene. Scapes 6 to 13 in. high; leaves obovate to oblong-lanceolate, acute; umbels 1 to 3-flowered, very long-pediceled; corolla lilac-purple; stamens 4, distinct; capsule cylindric, 6 to 8 lines long, valvate below the circumscissile stylar base, sometime splitting up to and through the lower part of the style.—Modoc Co. Flowers not known to us.

4. **D. cónjugens** Greene. Scapes 4 to 7 in. high; leaves oblong or often widest at the middle and tapering to each end, 1 to 1½ in. long; flowers 5-merous; corolla white or rose-purple, 6 to 7 lines long; anthers distinct, the connective rugulose.—Modoc Co.; Ore. to Mont. Too little known.

5. **D. clèvelandii** Greene. Scapes 1 to 2 ft. high; root-crown not producing rice-grain bulblets at flowering time; scapes, pedicels and calyces minutely glandular; leaves obovate, irregularly and sometimes saliently erose-dentate or entire, 1½ to 2¼ in. long, shortly petioled; flowers 5-merous; corolla bright purple to white, 6 to 11 lines long; connective of the anthers transversely much folded; capsule 4 to 5 lines long, twice as long as the calyx, dehiscent in a circle beneath the enlarged base of the style, then valvate-dehiscent below this; seeds reddish brown.—Dry hills and mesas, coastal S. Cal.

6. **D. pátulum** Greene. LOWLAND SHOOTING STAR. Fig. 735. Scapes only 3 to 5 in. high; leaves obovate, obtuse, ½ to 1¼ in. long, gradually narrowed to a broad petiole about ½ as long; corolla white, pale cream-color or rarely pinkish; anthers short and broad (1 line long), truncate or obscurely retuse at apex; filaments purple, the connective usually with a yellow or white spot above the purple base; capsule short-oblong or subglobose, circumscissile near the summit.—Slightly alkaline areas, Sacramento, San Joaquin and the South Coast Range valleys and their bordering foothills, mostly toward the interior. Mar. Var.

735. Dodecatheon patulum Greene; habit x ⅔.

LAETIFLÒRUM Jepson n. comb. Scapes 6 to 10 in. high; flowers white.—Hills bordering or near the Santa Clara Valley. (D. laetiflorum Greene.)

7. **D. hendersònii** Gray. MOSQUITO BILLS. SAILOR CAPS. Scapes red or reddish, 9 to 14 in. high, from a strong cluster of fleshy-fibrous roots; leaves roundish obovate to elliptic, the margin more or less crisped, 1 to 2½ in. long, on petioles ½ to 2 times as long; umbels 3 to 13-flowered, the pedicels ½ to 3½ in. long; flowers 5- or sometimes 4-merous; calyx cleft into ovate-lanceolate lobes; corolla-lobes oblong, 6 to 7 lines long, ¾ to 1½ (or 2) lines wide, purple with a transverse yellow zone at base, which is edged above by white and bounded below by a black-purple band; filaments black-purple; anthers linear or clavate, 2 lines long; capsule oblong or short-cylindric, circumscissile well below the summit, then valvate.—Low slopes to high ridges in the foothills, the most common species: Coast Ranges from Monterey Co. to Siskiyou Co., thence s. in the Sierra Nevada foothills to Tulare Co. Feb.-Apr. Var. BERNALIÀNUM Jepson n. comb. Petals rose-purple with a white zone below, this bordering the dark purple band of the united base of the corolla-segments; anthers oblong, 1½ lines long, retuse.—Open ridges, San Mateo Co. and San Francisco Co. The corolla-tube is closely reflexed, whereas in the species and in D. patulum its base is slightly folded over the base of the anthers. (D. patulum var. bernalianum Greene.) Var. GRÁCILE Jepson n. comb. Corolla white; petals twisted (ex char.).—Santa Cruz Mts. (D. patulum var. gracile Greene.)

2. PRÍMULA L.

Perennial herbs with basal leaves and scape-like stems bearing involucrate umbels. Calyx 5-toothed. Corolla salverform, its lobes obcordate or emarginate. Stamens 5, included, the filaments short. Capsule 5-valved at the top, many-seeded. (Latin primus, first, because of the early flowering.)

1. **P. suffrutéscens** Gray. SIERRA PRIMROSE. Scape 2 to 4 in. long, bearing an umbel of several flowers; leaves thickly crowded on creeping stems, cuneate-spatulate, toothed at apex, ¾ to 1¼ in. long; corolla red, its tube surpassing the calyx, its limb ½ in. broad with spreading lobes.—Crevices of rocks, alpine, 8000 to 12,800 ft., Sierra Nevada from Nevada Co. to Tulare Co. July.

3. ANDRÓSACE L.

Ours small annual herbs, with rosulate basal leaves and few to several scapes bearing an involucrate umbel of small white or pink-tinted flowers. Calyx-lobes 5. Corolla somewhat salverform, its lobes 5 (or 4), its tube shorter than the calyx, its throat constricted; stamens short and inserted low down upon the tube. Style mostly short. Capsule subglobose, dehiscent by valves. (Androsakes, Greek name of a now unknown sea-plant.)

Bracts linear, acute; scapes numerous; pedicels ascending, shorter than the scapes; alpine. 1. *A. septentrionalis.*

Bracts ovate-lanceolate, the tip attenuate-caudate; scapes about 2 or 3; pedicels stiffly ascending or divergent, often longer than the scapes; foothills..2. *A. occidentalis.*

1. **A. septéntrionàlis** L. var. **subumbellàta** A. Nels. Plants very much condensed, ½ to 1 in. high, the pedicels many from the dense tuft of basal leaves; leaves linear, obtuse, sometimes remotely denticulate, 2 to 6 lines long; umbels 3 to 7-flowered, the pedicels 1 to 5 lines long, shorter than the scapes; corolla very slightly exceeding calyx-lobes.—Alpine, 11,400 to 12,700 ft.: Mt. San Gorgonio; White Mts.; Mt. Dana; Siskiyou Co.

2. **A. occidentàlis** Pursh var. **acùta** Jepson n. comb. Plants ¾ to 2 in. high; leaves linear-lanceolate, 3 to 5 lines long; scapes spreading, ½ to 1¼ in. long; umbels 3 to 7-flowered, the pedicels very unequal, some often longer than the scape, ½ to 1⅜ in. long; calyx-lobes mostly shorter than the tube; corolla white, 1 line long, scarcely exserted from calyx-tube.—Hill-tops, 1500 to 2000 ft.: S. Cal. (Warners Hot Sprs., San Bernardino); South Coast Ranges (mostly towards the interior, Alcalde, Mt. Diablo, Berkeley Hills). (A. acuta Greene.)

736. Trientalis europaea var. latifolia Torr.; *a*, habit x ½; *b*, fl. x 1.

4. TRIENTÀLIS L.

Low and glabrous perennials. Rootstocks tuberous, sometimes stoloniferous. Stem simple, bearing scales or small leaves below and a whorl of large leaves above, from the center of which the filiform peduncles arise. Flowers commonly 6 (5 or 7)-merous. Corolla rotate, deeply parted. Filaments long and filiform, united at base into a very short ring. Style filiform. Capsule valves 5, revolute. (Latin trientalis, containing one-third of a foot, in allusion to the height of the plants.)

1. **T. europaéa** L. var. **latifólia** Torr. STAR-FLOWER. Fig. 736. Stems 4 to 6 in. high, from tubers ⅓ to nearly 1 in. long; leaves of the involucral whorl 3 to 6, 1 to 2 in. long, broadly obovate, abruptly acute, drawn down to a very short petiole; peduncles ¾ to 2 in. long; corolla white or rose-red, 4 to 8 lines broad, its divisions abruptly acuminate and prolonged into a slender point; calyx-lobes narrowly linear-lanceolate, mucronate, exceeding the capsule.—Woods, 100 to 4000 ft.: Coast Ranges (mostly in the seaward and middle ranges) from Monterey Co. to Del Norte Co.; Sierra Nevada from Mariposa Co. to Shasta Co.: n. to B. C.

5. GLAÚX L.

Somewhat succulent perennial with opposite leaves, distinguished from all other genera of the order by the absence of a corolla. Calyx purplish or white, campanulate, 5-lobed, assuming the appearance of a corolla, the stamens alternating with its lobes. Capsule 5-valved at apex. Seeds few, immersed in the tissue of the placenta. (Greek glaukos, sea-green.)

1. **G. marítima** L. SEA MILKWORT. Stems 8 to 11 in. high, erect or ascending, simple or eventually branching, arising from slender running rootstocks; leaves oblong, 4 to 9 lines long; flowers 2 lines long, solitary in the axils, almost sessile; calyx-segments elliptic; capsule globose, a little over 1 line long.—Marshy shores of bays: San Francisco Bay to Humboldt Bay; sea-coasts of north temperate and arctic lands.

6. ANAGÁLLIS L. PIMPERNEL

Low annuals with opposite or sometimes ternate entire leaves. Flowers axillary, on slender pedicels. Calyx deeply 5-cleft into narrow segments. Corolla rotate, deeply 5-parted, the rounded lobes convolute in the bud. Stamens 5; filaments hirsute or pubescent. Capsule circumscissile. (Greek, meaning delightful.)

1. **A. arvénsis** L. POOR MAN'S WEATHER-GLASS. Fig. 737. Stems 1 ft. long, procumbent or ascending; leaves ovate or deltoid-ovate, acute, sessile, 4 lines long, shorter than the pedicels; flowers opening only under a clear sky; sepals lanceolate, acuminate, scarious-margined toward the base, nearly distinct; corolla vermilion, 4 to 5 lines broad, the petals lightly joined at base, minutely glandular-ciliate at apex;

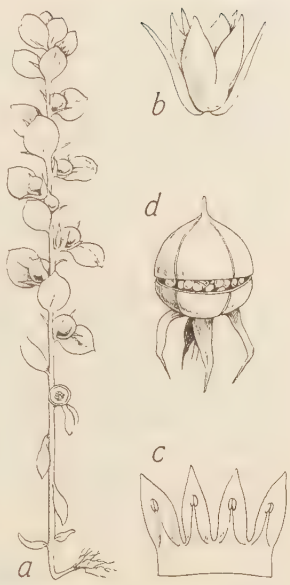
737. Anagallis arvensis L.; *a*, habit x ⅓; *b*, fl. x 1⅓; *c*, stamen x 2⅔; *d*, capsule x 1⅓.

capsules on recurved pedicels; seeds ½ line long, triangular, the surface pitted.—Weed, nat. from Eur., mostly near the coast. Var. COERÚLEA Ledeb. Corolla blue.—Mt. Diablo.

7. CENTÚNCULUS L.

Very small annuals with alternate entire leaves and minute solitary flowers in their axils. Calyx 4 (or 5)-parted, the narrow lobes linear-lanceolate, acuminate. Corolla 4 (or 5)-cleft, the tube subglobular and lobes acute. Stamens 4 or 5, inserted on the throat of the corolla. Capsule globose, circumscissile. Seeds many. (Meaning of name obscure.)

1. **C. mínimus** L. CHAFFWEED. Fig. 738. Slender, glabrous, 1 to 5 in. high; leaves obovate, sessile or short-petioled, 1 to 2 (or 3) lines long; flowers sessile or very nearly so, shorter than the leaves, mostly 4-merous; filaments much dilated at base.—Moist ground: San Diego; Ramona; Upland; Berkeley Hills; Antioch; Burson, Calaveras Co.; Suisun; Alton, Humboldt Co.; n. to Wash., e. to Ill. and Fla. May.



738. Centunculus minimus L.; *a*, habit x 1; *b*, fl. x 8; *c*, corolla spread open x 8; *d*, capsule x 5.

8. SÁMOLUS L. BROOKWEED

Glabrous perennial herbs with alternate leaves. Flowers small, white, 5-merous, in terminal racemes. Calyx adherent to the base of the ovary, campanulate. Corolla nearly campanulate. Stamens 5, borne on the tube of the corolla, their filaments short; a second series of stamens represented by 5 sterile filaments or staminodia inserted in the sinuses of the corolla and alternating with the anther-bearing stamens. Capsule opening at the apex by 5 valves. (Celtic name.)

1. **S. floribúndus** H.B.K. WATER PIMPERNEL. Stem commonly solitary, erect, simple or branching above into 2 or 3 racemes, or paniculate, 6 to 10 in. high; basal leaves rosette-like, round-obovate to oblong-spatulate, obtuse or almost truncate, narrowed toward the base into a broad short petiole, 1½ in. long; cauline leaves similar, the uppermost varying to elliptic, 3 lines long or more; pedicels slender, bractless, but bearing minute bractlets at their middle; calyx-teeth short, broadly triangular; corolla very small, white.—Brooks and marshes, rare: Suisun Marshes; Antioch; San Gabriel Mts.; San Bernardino Mts.; Riverside; Ramona; e. to the Atlantic, n. to B. C.; S. Am.

PLUMBAGINÀCEAE. THRIFT FAMILY

Maritime perennial herbs with hard or coriaceous scapes and basal leaves. Flowers regular, perfect, 5-merous throughout. Calyx tubular or funnelform, plaited. Petals with long claws barely united into a ring at base. Stamens opposite the petals, adnate to the base of the claw. Ovary superior, 5-angled at summit, containing a single ovule which hangs from an elongated funiculus arising from the base of the cell. Styles 5. Fruit a utricle or achene, borne in the base of the persistent calyx. Seed with endosperm; embryo straight.

Leaves narrowly linear; inflorescence head-like.....1. STATICE.
Leaves broad; inflorescence paniculate.....2. LIMONIUM.

1. STÁTICE L. THRIFT

Scape naked, terminating in a globose head of flowers. Leaves narrowly linear, sedge-like, in a close tuft. Heads composed of numerous crowded clusters, each cluster subtended by a scarious bract, the outer bracts form-

ing an involucre, the two outermost united and forming a reversed sheath to the summit of the scape. Flowers pediceled or subsessile, subtended by bractlets. Calyx scarious, funnelform. Corolla of 5 apparently distinct long-clawed petals, each with a stamen on its base. Styles filiform, united at the very base. (Greek statike, astringent.)

1. **S. árctica** Blake var. **califórnica** Blake. Sea-Pink. Scapes few or solitary, 7 to 20 in. high; leaves involute-channeled, ⅛ to 1 line wide, bluntish at tip, (1½ or) 4 to 8 in. long; flowers dull pink or flesh-color; calyx-tube 10-nerved, the nerves densely hispid; calyx-limb more or less erose.—Sea-beaches or sandy fields along the ocean, Monterey Co. to Del Norte Co. Apr.-June. (Armeria vulgaris Fl. W. Mid. Cal.)

2. LIMÒNIUM Hill. Marsh Rosemary

Leaves broad, fleshy, in a basal tuft. Flowers secund, in short spikes or clusters terminating the many branchlets of a branching scape. Calyx hairy on the angles below. Styles wholly distinct. (Greek name of the wild beet.)

1. **L. commùne** S. F. Gray var. **califórnicum** (Gray) Greene. Scapes ⅔ to 1½ (or 2) ft. high, loosely paniculate, the root ½ to 1 in. thick, reddish, woody; leaves obovate- to oblong-spatulate, obtuse or sometimes retuse, tapering below into a rather long petiole, 4 to 9 in. long; calyx-lobes membranous at tip; corolla violet-purple; petals oblong, narrowed towards the base, 2 to 2½ lines long.—Salt marshes and sea-beaches along the coast, Los Angeles Co. to Humboldt Co. July-Dec. (L. californicum Hel. Statice limonium var. californica Gray.)

STYRACÀCEAE. Storax Family

Shrubs or trees with alternate simple leaves. Flowers regular and perfect, the calyx in ours slightly adherent to the base of the ovary; petals 4 to 8, united or connivent at base into a short tube; stamens at least twice the number of petals. Ovary 2 to 5-celled; style 1.

1. STŸRAX L. Storax

Corolla white, seated in a campanulate calyx whose truncate border is denticulate, irregularly toothed or split down one side. Stamens 10 to 16, their filaments united for nearly their whole length into a tube, the lower portion of which is adherent to the base of the corolla. Ovary 1-celled through imperfect partitions but 3-celled at base. Style slender. Fruit globose, 1-celled, commonly splitting into 3 valves, with a single large nut-like or bony seed. (Ancient Greek name, used by Theophrastus, for the species which produces storax.)

1. **S. officinàlis** L. var. **califórnica** M. & J. Snow-drop Bush. Fig. 739. Deciduous shrub 5 to 10 ft. high; leaves orbicular to ovate (or somewhat rhomboidal), entire, minutely stellate or rusty-pubescent beneath, or in age glabrate, 1 to 2½ in. long, on tomentose petioles 2 to 4 lines long; flowers a little resembling orange blossoms, 2 or 3 (to 5) in a terminal corymbose raceme, the cluster borne on a very short peduncle; pedicels somewhat clavate; petals commonly 6 and stamens 12; petals oblong or somewhat narrowed towards the base, 6 to 7 lines long; stamen-tube pubescent with short soft hairs within; seeds 6 lines in diameter.—Dry slopes in the foothills, 500 to 2300 ft.: Lake Co. to Tehama Co.; Sierra Nevada foothills from Shasta Co. to Tulare Co.; San Bernardino Mts.; Santa Ana Mts. Also called Bitter Nut. Apr.-July. In Santa

739. Styrax officinalis L. var. californica M. & J.; *a*, branchlet x 1; *b*, fr. x ¾.

Barbara Co. replaced by the var. FULVÉSCENS (Eastw.) M. & J. Petioles rusty-tomentose; leaves often cordate at base; calyx-border more strongly denticulate.—Painted Cave Ranch, Santa Inez Mts.

OLEÀCEAE. ASH FAMILY

Trees or shrubs. Leaves opposite or sometimes alternate. Flowers small, commonly in compact panicles or clusters, mostly unisexual, sometimes perfect. Corolla sympetalous, choripetalous or none. Stamens few (1 to 4). Ovary superior, 2-celled; style 1. Fruit a samara, capsule or drupe.—This family includes Forsythia, Lilac, Olive and Privet of the gardens.

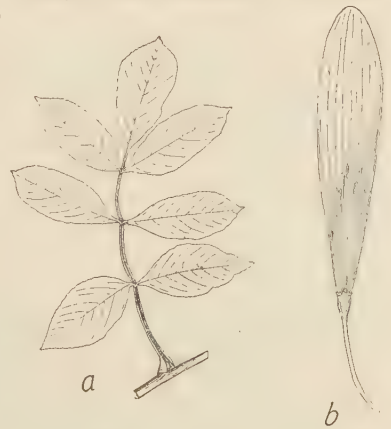
Leaves compound, opposite; fruit a samara.....1. FRAXINUS.
Leaves simple; fruit not a samara.
Fruit a drupe; leaves opposite.....2. FORESTIERA.
Fruit a circumscissile capsule; leaves mostly alternate, entire.....3. MENODORA.

1. FRÁXINUS L. ASH

Trees or shrubs. Leaves deciduous, pinnately compound. Flowers dioecious, perfect or polygamous, borne in small crowded panicles, appearing just before the leaves and from separate buds. Calyx small, truncate, with toothed border. Corolla with 2 equal petals or none. Stamens 2 (rarely 1 or 3). Ovules 2 in each cell. Fruit a 1-seeded samara, with terminal wing. (The Latin name of the ash.)

Trees; corolla none; style conspicuously 2-lobed.
Flowers dioecious; leaves pinnate; leaflets 2 in. long or more; branchlets terete.
Leaflets oblong to oval, the lateral commonly sessile; mostly cismontane.....
1. *F. oregona.*
Leaflets lanceolate, the lateral on petioles ⅛ to ½ in. long; desert ranges.....
2. *F. velutina.*
Flowers polygamous; leaves simple, rarely with 2 or 3 leaflets; branchlets of the season 4-sided; desert area.....3. *F. anomala.*
Shrub; corolla present; flowers perfect; style obscurely lobed; leaflets mostly stalked, less than 2 in. long; branchlets of the season 4-sided; cismontane.....4. *F. dipetala.*

1. **F. oregòna** Nutt. OREGON ASH. Fig. 740. Tree 30 to 80 ft. high; leaves 6 to 12 in. long; leaflets 5 to 7, oblong to oval, or often broadest toward the apex and abruptly short-pointed, usually sessile except the terminal one, entire or toothed above the middle, 2 to 5½ in. long; stamens 2 (sometimes 1 or 3); samara oblong-lanceolate, 1¼ to 2 in. long, including the wing, the body clavate and ½ to ¾ in. long.—Along streams or in valley or lake bottoms, 10 to 4000 ft.: throughout cismontane Cal.; n. base San Bernardino Mts.; Modoc Co.; Siskiyou Co.; n. to B. C.



740. Fraxinus oregona Nutt.; *a*, leaf x ¼; *b*, fr. x 1.

2. **F. velùtina** Torr. ARIZONA ASH. Tree 15 to 30 ft. high; leaflets 5, lanceolate to narrowly ovate, acute or less commonly attenuate, 2 to 4 in. long; samaras 1 in. long, the wing 1¼ to 2 lines wide.—Along desert streams or borders of lakes or springs: Owens Lake; Panamint Range; sw. base Mt. San Jacinto; between Campo and Jacumba; e. to Tex. Var. CORIÀCEA Rehd. Leather-leaf Ash. Leaflets narrowly or broadly ovate, more or less abruptly acute or attenuate.—Same range in Cal.; e. to Utah.

3. **F. anómala** Wats. DWARF ASH. Tree 15 to 20 ft. high, or a low spreading shrub; leaves simple, roundish or broadly ovate, 1½ to 2 in. long, or compound with 2 or 3 similar leaflets; flowers perfect and pistillate; samaras 8 to 9 lines long, with a rounded wing which surrounds the body and is 4 to 5 lines broad.—Desert ranges, Panamint and Providence mountains; e. to Col. and Tex.

4. **F. dipétala** H. & A. FOOTHILL ASH. Shrub 5 to 15 ft. high; leaves 2 to 6 in. long; leaflets 3 to 9, serrate above the middle, ¾ to 1½ in. long;

741. Forestiera neo-mexicana Gray; fr. branchlet x ¾.

petals 2, white, about 3 lines long; samaras 1 to 1¼ in. long, the wing frequently notched at tip.—Cañons or mountain slopes, 600 to 4000 ft.: Sierra Nevada; Coast Ranges; coastal S. Cal. Also called Mountain Ash and Flowering Ash.

2. **FORESTIÈRA** Poir.

Shrubs with opposite simple leaves. Flowers inconspicuous, dioecious or polygamous, few in a small panicle. Calyx minute or obsolete. Corolla none, or rarely 1 or 2 small petals. Stamens 2 to 4. Ovules 2 in each cell; style slender. Drupe 1-seeded. (M. Forestier, a French physician.)

1. **F. nèo-mexicàna** Gray. Fig. 741. Glabrous shrub with spiny branchlets, 5 to 10 ft. high; bark smooth, light gray or yellowish; leaves often fascicled, obovate, acute, serrulate above the cuneate base or entire, ½ to 1½ in. long including the short petiole; flowers in sessile clusters; drupe blue-black, ovoid, 3 to 4 lines long.—Valley flats or mountain cañons, 500 to 5500 ft.: San Jacinto Mts.; Mohave Desert and bordering mountain slopes; n. to the Salinas River and Gabilan Range; Owens Valley; e. to Col. and Tex.

3. **MENODÒRA** H. & B.

Low desert shrubs with simple leaves, the upper alternate, the lower often opposite. Flowers perfect. Calyx deeply cleft into 5 to 10 linear or subulate lobes. Corolla 5 (or 6)-lobed. Stamens 2. Ovules 4 in each cell; style slender. Fruit deeply 2-parted, each lobe splitting around the middle horizontally (the upper part falling as a lid) or sometimes splitting irregularly; seeds usually 2 in each cell. (Greek menos, force, and doron, gift.)

Corolla-lobes ⅓ or ¼ as long as the tube; flowers shortly peduncled or subsessile, solitary or somewhat fascicled on the short branchlets.....1. *M. spinescens.*
Corolla-lobes longer than the tube; flowers few in a terminal corymb.
Herbage glabrous.....2. *M. scoparia.*
Herbage minutely scabrous-puberulent.....3. *M. scabra.*

1. **M. spinéscens** Gray. Fig. 742. Shrub with very divaricate branches and short stout spiny branchlets, ½ to 2, rarely 3 ft. high; branches minutely puberulent; leaves alternate, linear to spatulate-oblong, 3 to 6 lines long on the flowering branchlets, fascicled and often reduced to mere scales on the main stems; flowers solitary or clustered, on peduncles 1 to 6 lines long; calyx-lobes 5 and equal (or 6 or 7 and more or less unequal); corolla white, brown-purple tinged outside, funnelform, 3 to 7 lines long, the limb 3 to 4 lines broad and with short broad lobes

742. Menodora spinescens Gray; *a*, fl. branchlet x ⅔; *b*, long. sect. fl. x 1⅓.

½ to ¼ as long as the tube; capsule yellowish, its lobes globose, 3 lines in diameter, diverging and, indeed, almost separate.—E. Mohave Desert (Ord Mts., Calico Mts., Providence Mts.), and n. to Inyo Co.; s. Nev.

2. **M. scopària** Engelm. Branches of the season slender, elongated, erect, more or less clustered, from a woody base, 10 to 15 in. high, not spinescent, sparsely leafy except at base; leaves linear or lanceolate, or the lower obovate; calyx-lobes 7 or 8; corolla yellow, almost rotate, 4 to 6 lines long, its lobes ovate, exceeding the tube; lobes of the capsule globose, not diverging. —Colorado Desert (Jacumba); e. to Tex., s. to Mex.

3. **M. scàbra** Gray. Near no. 2; stems erect, numerous from a woody base or crown, 5 to 12 in. high; leaves oblong to linear, 4 to 7 lines long; calyx-lobes 10; corolla bright yellow, 4 to 5 lines long.—Providence Mts.; e. to Tex., s. to Mex.

GENTIANÀCEAE. Gentian Family

Glabrous herbs with a colorless bitter juice. Leaves opposite, simple, sessile and entire (3-foliolate and basal in Menyanthes). Flowers perfect, regular. Calyx persistent, 4 or 5-toothed or -parted. Corolla four or five-lobed or -parted, usually withering-persistent, its lobes commonly convolute in the bud. Stamens on the tube or throat of the corolla, as many as its lobes. Ovary superior, 1-celled, with 2 parietal placentae; style 1 or none; stigmas 2. Fruit a 2-valved septicidal capsule, the incurved edges bearing the seeds.—Eustoma is rarely 6-merous.

Leaves simple, entire, sessile except some basal ones.
  Corolla without glands.
    Corolla salverform; annuals.
      Flowers yellow; anthers unchanged after anthesis.....1. Microcala.
      Flowers red or pink; anthers twisting spirally after shedding pollen.....
        2. Centaurium.
    Corolla campanulate to funnelform, blue or white.
      Style filiform; stamens inserted in the corolla throat.....3. Eustoma.
      Style stout, short or none; stamens inserted in the corolla tube.4. Gentiana.
  Corolla-lobes with conspicuous fringed glands.....5. Swertia.
Leaves 3-foliolate; corolla-lobes bearded with white filaments.....6. Menyanthes.

1. MICRÓCALA Hoffmgg. & Link

Almost minute annual. Stem simple, or with peduncle-like branches terminating in a 4-merous yellow flower. Calyx 4-toothed. Corolla short-salverform, the 4 short stamens inserted on its throat. Anthers cordate-ovate. Stigma of 2 fan-shaped lobes which at length separate. (Greek mikros, small, and kalos, beautiful.)

1. **M. quadrángulàris** (Lam.) Griseb. Stem commonly 1 to 2 in. high, with 1 to 3 pairs of oval or oblong leaves below, these 1½ to 3 lines long; peduncle naked, quadrangular; calyx short, strongly quadrangular, and seeming as if truncate at base and apex, especially in fruit, when it is 2 to 2½ lines long; corolla deep yellow, the lower half membranous, twice as long as the calyx, open under a sunny sky, closing in afternoon.—Level or moist country in the neighborhood of low hills, or in open woods, mostly of the outer Coast Ranges: Shasta and Mendocino Cos. to Alameda Co. and San Francisco.

2. CENTAÚRIUM Hill. Canchalagua

Low erect leafy annuals. Flowers red or pink, 5 or sometimes 4-merous, in cymes. Calyx deeply parted, its lobes narrow, carinate. Corolla salverform. Stamens commonly 5 (or 4); filaments slender, inserted on the corolla throat; anthers oblong or linear, twisting spirally after shedding their pollen and commonly exserted. Style filiform, deciduous; stigmas oblong to fan-shaped. Capsule oblong-ovate to fusiform, 1-celled, but the seed-bearing edges of the valves more or less approximate in the center. Seeds oblong or spherical, reticulate-pitted. (Latin centum, a hundred, and aurium, gold piece, certain species valued medicinally.) Erythraea L. C. Rich.

Anthers oblong; flowers small; corolla-lobes ⅓ to ¼ as long as the tube.
  Flowers all on slender pedicels.....1. *C. exaltatum.*
  Flowers in the forks sessile or subsessile, the others sessile or shortly pediceled.....
    2. *C. muhlenbergii*

Anthers linear; flowers large; corolla-lobes ⅗ to nearly as long as the tube; flowers pediceled to subsessile.
Stigmas spatulate-fanshaped; S. Cal. and Sierra Nevada.....3. *C. venustum.*
Stigmas short, not spatulate; Coast Ranges.....4. *C. trichanthum.*

1. **C. exaltàtum** (Griseb.) Wight. Stem very slender, very strict, (3 or) 8 to 14 in. high; flowers on elongated (½ to 2¼ in. long) pedicels in a loose cyme; corolla pale pink, its lobes 2 to 2½ lines long, ⅓ as long as the tube.—S. Cal. and n. through the desert region east of the Sierra Nevada; n. to Wash., e. to Utah. Var. DÀVYI Jepson n. var. Plants smaller, 2 to 6 in. high, with usually simpler stems, larger corolla lobes, and fan-shaped or almost kidney-shaped stigmas.—Coast Ranges from San Luis Obispo Co. to Mendocino Co. (West Berkeley, Davy 596, type).

2. **C. muhlenbérgii** (Griseb.) Wight. Stem much branched from the base to nearly simple, 2 to 9 in. (rarely 1 to 2 ft.) high; leaves narrowly oblong to ovate-lanceolate; flowers sessile or nearly so, in the forks, the lateral ones shortly pediceled or subsessile; corolla-lobes oval to oblong or ovate-lanceolate, obtuse or retuse, 1½ to 2½ lines long, ⅓ as long as the tube; anthers oblong.—Santa Clara Co. e. to Tuolumne Co., n. to Siskiyou Co.; far n. to Wash.

743. Centaurium venustum Rob.; *a*, habit x ½; *b*, long. sect. of corolla x 1½; *c*, pistil x 1½; *d*, cross sect. of ovary x 8.

3. **C. venústum** (Gray) Rob. Fig. 743. Stem 4 to 8 in. high, almost simple and with few flowers to corymbosely branched with numerous flowers; calyx-lobes reaching to or nearly to corolla throat; corolla vermilion or rose-color, the throat white, marked with 5 red spots or crescents; corolla-lobes elliptic to oblong, obtusish or acute, often denticulate at apex, 5 lines long, nearly as long as the tube; anthers linear; stigmas spatulate fan-shaped or spoon-shaped.—Common in S. Cal.; n. through the Sierra Nevada to Butte Co.

4. **C. trichánthum** (Griseb.) Rob. Very near to no. 3; stem corymbosely and rather densely branched with numerous flowers; corolla-lobes oblong, acute, ⅗ as long as the tube; flowers sessile in the forks, and sessile along the branches or shortly pediceled; stigmas short, transversely oblong without a stalk-like base.—Dry often alkaline ground, Santa Cruz Mts. to Napa Co., thence n. to the Yollo Bolly Mts. and Siskiyou Co.

3. EÙSTOMA Salisb.

Ours a glaucous perennial herb. Flowers blue or white, long-peduncled, axillary and terminal, 5 or 6-merous. Calyx-lobes long-acuminate, keeled. Corolla campanulate-funnelform, its lobes more or less erose-denticulate. Stamens inserted on the throat of the corolla; anthers straight or recurving in age. Style filiform. Capsule oval or oblong. (Greek eu, good, and stoma, mouth, the corolla throat large.)

1. **E. silenifòlium** Salisb. Erect, 1 to 2½ ft. high; leaves broadly oblong, 1½ to 3 in. long, thickish, subcordately clasping; corolla-lobes obovate or oblong, 9 to 10 lines long, twice length of tube.—Valleys, 500 to 1500 ft., S. Cal.: Santa Ana Cañon near Olive; Riverside; San Bernardino; Palm Sprs. of Mt. San Jacinto; s. to L. Cal., e. to Fla. Aug.

4. GENTIÀNA L. Gentian

Herbs with opposite sessile leaves and showy usually blue flowers. Calyx 4 or 5-cleft. Corolla campanulate or funnelform, the lobes 4 or 5 and often with teeth or plaited folds in their sinuses. Stamens inserted on the tube of the corolla, included. Style short and persistent, or none; stigmas 2. Capsule oblong, enclosed in the withering-persistent corolla; seeds small, very numerous with a loose cellular or winged coat. (Gentius, king of Illyria, who discovered the tonic properties of these herbs.)

Annuals; calyx-tube without an inner membrane; anthers versatile.
Corolla without teeth or lobes in the sinuses; leaves not white-margined.
Flowers solitary; corolla-lobes without a crown at base.
Stems several from the base; flowers long-peduncled.....1. *G. holopetala.*
Stems simple; flowers short-peduncled.....2. *G. simplex.*
Flowers clustered; corolla-lobes with a fimbriate crown at base...3. *G. amarella.*
Corolla with toothed lobes in the sinuses; flowers solitary; leaves white-margined....4. *G. humilis.*
Perennials; calyx-tube with an inner membrane which projects slightly above the insertion of the lobes; anthers erect; leaves (at least the lower cauline) with connate sheaths at base 1 to 3 lines long.
Alpine dwarf, 1¼ to 2 in. high.....5. *G. newberryi.*
Stems ½ to 2 ft. high, leafy.
Uppermost pair of leaves forming an involucre about the terminal 1 to 5-flowered cluster; sinus appendages lacerate.
Involucrate leaves united below; corolla-lobes apiculate; North Coast Ranges. 6. *G. setigera.*
Involucrate leaves scarcely united; corolla-lobes obtuse; Sierra Nevada....7. *G. calycosa.*
Uppermost pair of leaves often approximating the flowers but quite distinct.
Sinuses of the corolla with teeth or lobes.
Calyx-lobes oblong to ovate-lanceolate, subequal.....8. *G. oregana.*
Calyx-lobes linear to narrow-lanceolate, unequal.....9. *G. affinis.*
Sinuses of the corolla without lobes or appendages.....10. *G. sceptrum.*

1. **G. holopétala** Holm. Fig. 744. Stems several from the base, 4 to 14 in. high, leafy below and ending above in a long naked, 1-flowered peduncle; basal leaves obovate, the cauline linear-oblanceolate, acute, ½ to 1½ in. long; calyx ½ to ¾ as long as the corolla, cleft to the middle or below into lanceolate-subulate lobes; corolla 1½ (or 2) in. long, its lobes broad and short (obovatish), entire or erose-denticulate; seeds scaly-roughened.—Montane, 6000 to 11,000 ft.: Sierra Nevada from Mariposa Co. to Tulare Co.; San Bernardino Mts. July. (G. serrata var. holopetala Gray.)

744. Gentiana holopetala Holm; habit x ½.

2. **G. símplex** Gray. Fig. 745. Stems always simple, 3 to 12 in. high, bearing 2 to 4 (or 5) pairs of leaves and ending in a single peduncled flower; leaves linear-oblong to lanceolate, 4 to 8 lines long; calyx ½ to ¾ as long as the corolla, cleft to the middle or below, its lobes lanceolate but not subulate-tipped; corolla 1 to 1¼ in. long, its lobes obovatish, rounded, finely toothed all around or subentire; capsule stipitate; seeds striate longitudinally, roughened at each end.—Wet meadows, 4000 to 9500 ft.: San Bernardino Mts.; Sierra Nevada; n. to southern Ore.

3. **G. amarélla** L. var. **acùta** Herder. Fig. 746. Stem slender, strictly and sparingly branched, 1 to 1½ ft. high; flowers 1 to 3 in the axils or terminal, on pedicels 3 to 11 lines long; calyx about half as long as the corolla, deeply lobed; corolla tubular, 4 to 6 lines long, its lobes about ¼ as long as the

tube, bearing below the middle inside a series of slender fimbriae. — Montane, 6200 to 8000 ft.: San Bernardino Mts.; Sierra Nevada; Trinity Mts.; n. to Alas., e. to N. Mex. and Lab.

4. **G. hùmilis** Stev. Stems erect, simple or several from the base, 1½ to 3 in. high, leafy throughout and bearing a single terminal flower; herbage yellowish-green; leaves white-margined, 2 to 3 lines long, the basal round-ovate, the cauline oblong, connate at base; calyx-lobes short; corolla tubular, "salverform in anthesis," dull white, 4 to 5 lines long, its tube little exceeding the calyx; sinus appendages toothed; capsule protruded at maturity, when open becoming trumpet-shaped, 2 lines wide, its valves remaining somewhat united below.—Boggy meadows, San Bernardino Mts.; Rocky Mts.; Asia. (G. fremontii Torr. G. viridula Parish.)

745. Gentiana simplex Gray; fl. stem x 1.

746. Gentiana amarella L. var. acuta Herder; infl. x 1.

5. **G. newbérryi** Gray. Fig. 747. Alpine dwarf, the one-flowered stems ¼ to 2 (or 4) in. long; leaves mostly round-obovoid to oblanceolate; calyx-tube turbinate, its lobes linear or lanceolate, equaling or longer than the tube; corolla blue, white inside and greenish-dotted, 1 to 1¼ in. long, commonly twice as long as the calyx, its lobes erect, ovate, acute, very short, with a longitudinal slate-brown band outside; sinus appendages broad, with 1 or 2 teeth.—High montane, 6600 to 12,000 ft.: Sierra Nevada from Mt. Whitney to Lassen Peak; n. to southern Ore.

6. **G. setígera** Gray. Stems several from the root-crown, ascending, 10 to 12 in. long, bearing terminally one or several flowers; leaves roundish to ovate, obtusish, 1 to 1½ in. long, the uppermost pairs covering the bases of the flowers; calyx-lobes ovate, about as long as the tube; corolla subcampanulate, 1½ to 1¾ in. long, the lobes erosulate, apiculate, nearly as broad as long, the sinus appendages produced into 2 to 6 capillary bristles nearly as long as the lobes; seeds winged. — Mendocino Co. to Siskiyou Co.

747. Gentiana newberryi Gray; habit x ⅔.

7. **G. calycòsa** Griseb. Fig. 748. Stems several from a stoutish root-crown, 6 to 12 in. high; leaves ovate, acute, ½ to 1½ in. long; flowers one and terminal or commonly few and shortly pediceled in the uppermost axils, thus forming a close terminal cluster, rarely with one or few supplementary flowers on long pedicels from the axils below; calyx-tube membranous, broadly oblong, 2 to 3 lines long, its lobes ovate, contracted at base, unequal, about

as long as the tube and inserted just below its truncate border; corolla 1¼ to 1½ in. long, its lobes short and roundish, obtuse, yellowish-dotted, ¼ as long as the tube; sinus appendages triangular-subulate, prominent; corolla-tube with 2 greenish-dotted elongated areas beneath each lobe; seeds wingless.—Montane, 6000 to 8000 ft.: Sierra Nevada from Tulare Co. to Siskiyou Co.; n. to B. C. and Mont.

8. **G. oregàna** Engelm. Stems erect, several from a stout taproot, 1 to 2 ft. high; leaves ovate or oblong-ovate, ¾ to 1½ in. long; flowers few to several at summit; calyx-lobes oblong to ovate-lanceolate, as long as tube; corolla broadly funnelform, 1¼ to 1⅜ in. long, its border light blue, the spreading lobes roundish-ovate, not narrowed at base; sinus appendages conspicuous, subulate or toothed; capsule more or less stipitate; seeds winged. — Near the coast, open grassy or sandy lands, Marin Co. to Humboldt Co., thence e. to Shasta Co.; n. to B. C. Very close to no. 7.

748. Gentiana calycosa Griseb.; fl. stem x ⅔.

9. **G. affinis** Griseb. Stems several from a root-crown, ½ to 1½ ft. high; leaves "lanceolate-oblong" to ovate, ¾ to 1¼ in. long; bracts rather narrow; flowers several, congested on short pedicels in the upper axils; calyx-tube with obsolete inner rim, its lobes linear to subulate, very unequal, the 3 longest 2 to 3 lines long (sometimes nearly equaling the tube), the other 2 much shorter, or reduced to mere teeth, or obsolete; corolla purple, its lobes short, rounded but with a short point; sinus appendages acute, sparingly toothed, or sometimes sparingly laciniate; seeds obliquely elliptic in outline, winged all around.—Warner Mts., Modoc Co.; n. to B. C., e. to Minn. and N. Mex.

10. **G. scéptrum** Griseb. Stems very upright, ¾ to 2 ft. high, several from a cluster of cord-like roots, mostly simple, leafy to the top, bearing 1 to several flowers; leaves oblong to ovate-lanceolate, ¾ to 1½ in. long, thinner than in no. 8; calyx ⅛ to ½ as long as the corolla, lobed about to the middle; corolla broadly funnelform, 1½ to 1¾ in. long, its throat and border clear deep blue, commonly greenish-dotted, its lobes short, roundish, 3 to 4 lines broad; sinus membrane truncate and entire or obscurely toothed, not prolonged into appendages; seeds narrow-oblong, wingless. — Boggy spots, or sphagnum swamps, Mendocino and Humboldt Cos.; n. to B. C.

5. SWÉRTIA L. Frasera

Ours perennial herbs with erect stems from a thick bitter root. Leaves opposite or whorled. Flowers borne in a panicle. Corolla dull white, bluish-tinged or yellowish, commonly with dark dots, rotate, deeply 4 or 5-parted, each lobe bearing 1 or 2 fringed glands. Stamens inserted on the base of the corolla. Style persistent. Capsule coriaceous, more or less flattened, surrounded by the persistent dry corolla. (Emanuel Sweert, Dutch botanist, 16th century.)

Flowers 5-merous, 1 or 2 in an axil.....1. *S. perennis.*
Flowers 4-merous.
Stem leaves in opposite pairs; glands single.
Flowers in a narrow spike-like interrupted panicle; glands not lobed.
Glands linear or oblong; leaves white-margined.
Herbage glabrous; scales between filaments entire or laciniate.....
2. *S. nitida.*
Herbage finely pubescent; scales between filaments setiform-dissected..
3. *S. albicaulis.*
Glands quadrate; leaves not white-margined.....4. *S. neglecta.*
Flowers in a broad branching panicle.
Glands elongated-oblong, forked at summit; leaves with silvery-white margins.....5. *S. albomarginata*

Glands like an inverted yoke or horse-shoe; leaves not white-margined..... 6. *S. parryi.*

Stem leaves in whorls of 3 to 7; flowers in a wand-like panicle.
Glands one to each corolla-lobe, covered by an elongated 2-lobed tube; leaves white-margined.....7. *S. tubulosa.*
Glands a pair to each corolla-lobe, not covered by a tube; leaves not white-margined.....8. *S. radiata.*

1. **S. perénnis** L. var. **obtùsa** Griseb. Fig. 749. Stems solitary, arising from short root-stocks, 5 to 18 in. high; basal leaves obovate or elliptic, 1 to 2½ in. long, contracted to a ligulate petiole ½ to 1½ times as long; stem leaves few and mostly smaller; flowers solitary or in 2s in the axils of the reduced upper leaves or bracts, on pedicels ¼ to 1 in. long; corolla greenish-white, veined or suffused with bluish-purple, its lobes oblong-ovate, 4 to 5 lines long; glands 2 on the base of each lobe, elliptic, fringed all around; capsule elliptic, flattened, 5 lines long.—High montane, 8500 to 10,300 ft.: s. Sierra Nevada in Fresno and Tulare Cos.; Ore. to Col. and Alas.; Asia, Eur. (S. covillei Greene.)

749. S. perennis var. obtusa Griseb.: cor.-lob. x 4.

2. **S. nítida** Jepson n. comb. Fig. 750. Stems slender, 10 to 18 in. high; herbage glabrous; leaves linear-oblanceolate, 3 to 7 or 9 in. long; flowers in dense cymes in the axils of the reduced upper leaves or bracts, thus forming a very narrow interrupted thyrsus; cymes sessile or the lower peduncled; corolla pale bluish, purple-dotted inside, 3½ lines long; corolla-lobes ovate, shortly and often abruptly acute, each with a single greenish gland; gland linear or oblong, nearly naked above; scales between the filaments thin, obovate, acuminate, entire or laciniate, rather longer than the ovary; capsule elliptic, flattened, 4 to 6 lines long.—Gravelly soil, often on brushy slopes, 800 to 5500 ft.: Lake Co. to Siskiyou Co.; Plumas Co. to Modoc Co.; n. to Ore. (Frasera nitida Benth.)

3. **S. albicaúlis** Dougl. Similar to no. 2; herbage minutely pruinose-puberulent; corolla-lobes ovate-lanceolate, acuminate; scales between the filaments setiform-dissected. — Interior plateau region: Modoc Co.; n. to eastern Wash. and western Mont. (Frasera albicaulis Griseb.)

750. Swertia nitida Jepson; *a*, *b*, habit x ⅓; *c*, cor.-lob. x 2½; *d*, *e*, scales x 2½.

4. **S. neglécta** Jepson n. comb. Stems slender, several from the branching crown of a taproot, 1 to 1½ ft. high; leaves narrowly linear to narrowly oblanceolate, acute, 3 to 5 or 8 in. long; flowers in dense whorl-like cymes forming an interrupted spike-like panicle, the cymes sessile or the lower peduncled; corolla greenish-white with purple veins, its lobes obovate, abruptly acute, 4 to 5 lines long; gland quadrate, partly covered at base and on the sides, fringed all around, produced downward as a tube within the tissue of the petal.—Desert slopes of the San Bernardino, San Gabriel and San Emigdio ranges, 5900 to 7600 ft. (Frasera neglecta Hall.)

5. **S. albomárginàta** (Wats.) Ktze. Fig. 751. Stems solitary from a perennial taproot, 8 to 15 in. high; herbage glabrous or minutely pubescent; leaves spatulate or oblanceolate, dis-

751. Swertia albomarginata Ktze.; corolla-lobe x 4.

posed to be conduplicate, 1½ to 3 in. long, ornamented with a bright-silvery margin; flowers in a rather broad branching panicle; corolla-lobes greenish-white, dark-dotted, 4 to 5 lines long; gland single, elongated-oblong, produced below into the basal tissue of the petal and thus hooded at base, the dilated summit obcordate and fringed-margined, the sides with a free laciniate border. —Gravelly or stony places: e. Mohave Desert; Inyo Co.; e. through the southern desert region of the Great Basin to Utah. (Frasera albomarginata Wats.) Var. PURPUSII Jepson n. var. Gland small, elliptic, not obcordate at summit.—Cottonwood Creek Cañon, Inyo Co. (Purpus 3065, type).

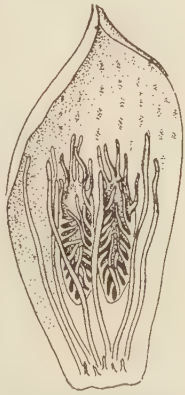
6. **S. párryi** (Torr.) Ktze. Fig. 752. Stem single, stout, arising from the crown of a taproot, 2½ ft. high; herbage glabrous; leaves white-margined, the basal oblanceolate and drawn down to a narrow base, 4 to 8 in. long, the stem leaves lanceolate, sessile by a broad base, 2 to 6 in. long; panicle broad, 6 to 12 in. long, its flowers on pedicels ½ to 1 in. long; corolla greenish-white, black-dotted about gland, 6 to 8 lines long, its lobes ovate; glands yoke- or horseshoe-shaped, fringed all around; capsule terete-lanceolate, 7 to 8 lines long—Coastal S. Cal., 2000 to 5500 ft. (Frasera parryi Torr.)

752. Swertia parryi Ktze.; corolla-lobe x 4.

753. Swertia tubulosa Jepson; corolla-lobe x 4.

7. **S. tubulòsa** Jepson n. comb. Fig. 753. Stems stout, erect, glaucous, arising from a deep seated taproot, 1 to 2¼ ft. high; herbage glabrous; leaves mainly basal, spatulate, white-margined, tending to be conduplicate, 1½ to 3 in. long; inflorescence a virgate or spike-like panicle, very dense, or interrupted below; corolla pale white with bluish veins, 4 to 6 lines long, its lobes oblong-obovate, acuminate, each bearing at base a gland covered by an elongated tube which is deeply 2-lobed with the lobes fringed or laciniate; capsule elliptic, flattened, 4 lines long. — Montane, 8500 to 9300 ft., s. Sierra Nevada from Kearsage Pass to Olancha Peak. (Frasera tubulosa Cov.)

8. **S. radiàta** (Kell.) Ktze. DEER'S TONGUE. Fig. 754. Stem very stout, erect, simple below the panicle, 2 to 5 ft. high, from a stout taproot; herbage very minutely puberulent; leaves oblong-oblanceolate (or narrowly oblong or obovate), acute, 9 to 13-nerved, 5 to 11 (or 15) in. long; panicle narrow, 1 to 2 ft. high; flowers on pedicels 1 to 2½ in. long; corolla greenish-white, purple-dotted, its lobes ovate, acute, each with fringed or laciniate appendages at base; glands 2 to each lobe, narrowly oblong, long-fringed all around, the crown at the base of the lobes cut into setaceous segments which reach to the middle or summit of the glands; capsule 8 to 9 lines long, ovate, flattened contrary to the valves, which are boat-shaped.—Open coniferous woods, 7000 to 9000 ft.: Sierra Nevada from Tulare Co. to Siskiyou Co., thence s. to northern Humboldt Co.; n. to Wash., e. to the Rocky Mts. It is widely distributed but the individuals are mostly solitary. (Frasera speciosa Dougl.)



754. S. radiata Ktze.; cor.-lob. x 4.

6. MENYÁNTHES Tourn.

Perennial herbs with creeping rootstocks. Leaves all basal and the inflorescence raised on a naked scape. Calyx 5-parted. Corolla white or pink, short-funnelform, 5-cleft, the lobes spreading, copiously white-bearded on the inside. Stamens 5. Capsule inclined to burst irregularly. (Greek men, month, and anthos, flower, blooming about that long.)

1. **M. trifoliàta** L. Buckbean. Glabrous plant 8 to 15 in. high; leaves long-petioled, 3-foliolate; leaflets oval or obovate, 1 to 3½ in. long; flowers in a raceme; corolla white, 5 to 6 lines long.—Bogs and shallow lake shores, 6600 to 9500 ft.: Sierra Nevada from Fresno Co. to Lassen Peak; n. to Alas. and all northern regions round the earth.

APOCYNÀCEAE. Dogbane Family

Ours perennial herbs with milky juice. Leaves simple, entire and opposite. Flowers complete, regular, 5-merous except the pistils which are 2. Calyx free or nearly free from the ovaries, imbricated in the bud and persistent. Corolla-lobes convolute in the bud. Stamens borne on the corolla alternate with its lobes; anthers produced at base into a sterile appendage, connivent around the stigma. Ovaries 2 and distinct (though their styles and stigmas are united into one), developing into follicles. Embryo large, straight, in scanty albumen. A family closely allied to the milkweeds.

Stamens borne on the summit of the corolla-tube; anthers free from the stigma; buds sinistrorsely convolute; seeds not comose.
- Leaves alternate; flowers without glands ..... 1. Amsonia.
- Leaves opposite; flowers with 2 glands alternate with the carpels ..... 2. Vinca.

Stamens borne on the base of the corolla-tube; anther-cells produced at base into sterile appendages connivent around the stigma and adnate to it by a point at the base of the fertile portion; follicles not torulose; seeds comose.
- Style very short, not appendaged; corolla-tube with 5 small appendages alternate with the stamens; buds dextrorsely convolute ..... 3. Apocynum.
- Style filiform, bearing a conspicuous annular membrane; corolla-tube with a minute appendage behind each stamen; buds not convolute ..... 4. Cycladenia.

1. AMSÒNIA Walt.

Leaves numerous. Flowers in a terminal compound cyme. Corolla in ours dilated upwards, constricted at the mouth; tube within below the stamens beset with reflexed hairs. Anthers free from the stigma. Stigmas subtended by a globose thickening (in ours). Follicles slender, torulose. (Charles Amson of South Carolina.)

1. **A. brevifòlia** Gray. Stems many from the crown of a stout taproot, 8 to 10 in. high; herbage glabrous; leaves ovate to lanceolate, acuminate, nearly sessile, 1 to 2 in. long; corolla-tube slender below, dilated above and constricted at the throat, its lanceolate lobes primly reflexed, half as long as the tube; follicles inclined to break into one-seeded joints.—Desert flats and cañons: n. side Colorado Desert; e. Mohave Desert; Inyo Co.; e. to Utah. Var. tomentòsa Jepson n. comb. Stems 10 to 15 in. high; herbage cinereous-tomentose.—Sandy plains: n. side Colorado Desert; e. Mohave Desert; e. to Utah. (A. tomentosa Torr. & Frem.)

2. VÍNCA L.

Flowers solitary and axillary. Corolla with a callous constriction at the throat, its lobes broad. Stigma annular, bordered below by a reflexed membranous wing or cup, and above by a truncate upper portion. Follicles narrow, terete. (Ancient Latin name.)

1. **V. màjor** L. Sterile stems trailing, the flowering ones erect; corolla blue, 1 to 1¼ in. broad.—Native of Eur., escaped from gardens into protected areas along water-courses in cañons about San Francisco Bay.

3. APÓCYNUM L. Indian Hemp

Flowers small, in terminal cymes. Calyx small, deeply 5-cleft, its tube by means of a disk adnate to the back of the ovaries below. Corolla campanulate, 5-lobed, bearing 5 small triangular-subulate appendages alternate with the stamens. Stamens borne at base of corolla; filaments short and broad; anthers sagittate, acute. Style very short or hardly any; stigma ovoid,

755. Apocynum androsaemifolium L. var. pumilum Gray; *a*, fl. branchlet x ½; *b*, fl. x 1½; *c*, long. sect. of fl. x 4½.

obscurely 2-lobed. Follicles 2 to 7 in. long, slender, pointed, terete. Seeds numerous, flattish. (Greek apo, from, and kuon, dog, ancient name of the Dogbane.)

Low herb; leaves greenish above; corolla rose-purple to white.....
1. *A. androsaemifolium.*
Tall herb; leaves yellowish; corolla greenish.....2. *A. cannabinum.*

1. **A. androsaémifòlium** L. var. **pùmilum** Gray. MOUNTAIN HEMP. Fig. 755. Diffusely branched, 5 to 8 (or 14) in. high, glabrous to finely pubescent; leaves roundish to oblong-ovate, or some lowermost orbicular, varying from obtuse to cordate at base, usually mucronate, dark green above, pale beneath, ¾ to 1¼ (2¼) in. long, on short petioles; flowers in short cymose clusters at the ends of the branches, or a few solitary in the upper axils; corolla red-purple or pink to nearly white, subcylindric, 2 to 3 lines long, its lobes broadly oblong, its tube much exceeding the ovate or lanceolate calyx-lobes. — Mostly loamy slopes in the mts., 4000 to 9000 ft., towards the coast descending to 300 ft. June-July. Var. NEVADÉNSE Jepson n. var. Flowers pink with deeper pink longitudinal lines.—Tuolumne to Fresno and Mono Cos. (Huntington Lake, A. L. Grant 1124, type).

2. **A. cannabìnum** L. INDIAN HEMP. Stems erect, rather strict, simple below, 2 to 4 ft. high; herbage of a light almost yellowish green, glabrous; leaves oval to oblong-ovate or lanceolate, 2½ to 4 in. long; sessile or short-petioled; corolla greenish, 1½ lines long or less, its segments not surpassing the calyx-lobes.—Stream and river-banks, widely distributed in Cal., more common toward the interior; far e. and n. Poisonous to cattle. May-July.

4. CYCLADÈNIA Benth.

Stems simple, one to many from a large fleshy root, bearing 2 or 3 pairs of leaves and 2 or 3 axillary peduncles with 2 or 3 rose-purple flowers on slender pedicels. Calyx parted into 5 slender lobes. Corolla funnelform with 5 broadly oblong or roundish lobes and 5 minute appendages alternate with the lobes, one behind each stamen. Stamens borne on the tube towards the base. Style long and filiform, with a conspicuous membranous reflexed collar under the stigma. Disk an entire cup surrounding the base of the ovaries. (Greek kuklos, a ring, and aden, a gland, referring to the disk.)

1. **C. hùmilis** Benth. Stems ascending or diffuse, 3 to 6 in. high; herbage glabrous; leaves thickish, ovate or roundish, obtuse to cordate at base, 1¼ to 2½ in. long, on petioles ¼ to 1 in. long; corolla 7 to 10 lines long, bearing a narrow band of reflexed hairs at the insertion of the stamens, the filaments also clothed with similar hairs; pedicels 7 to 10 lines long; follicles 3 in. long.—Montane or gravelly ridges, 5800 to 8500 ft.: Coast Ranges; Sierra Nevada; San Gabriel Mts. Var. TOMENTÒSA Gray. Herbage densely tomentose-pubescent; calyx hirsute.—Plumas Co. to Siskiyou Co. (C. tomentosa Gray.)

ASCLÈPIADÀCEAE. MILKWEED FAMILY

Perennial herbs with milky juice. Leaves opposite or whorled. Flowers regular. Calyx 5-parted. Corolla 5-lobed. Pistils 2, with distinct superior ovaries; styles distinct below but united above into a short-cylindric stylar

disk. Stamens 5, inserted on the base of the corolla and united into a tube which is blended above with the stylar column, the united filaments (filament-column) and united anthers (anther-column) being here called the stamen-column and commonly bearing hoods (or appendages). Anthers tipped with a scarious membrane inflexed on the summit of the stylar disk; between the anthers, on the sides of the stylar organ, are cloven glands or elevated ridges slit longitudinally. Pollen grains in each anther-cell united into waxy pear-shaped masses which are stalked and suspended in pairs from the summit of the cloven glands, each pair of stalks deriving its pollen-masses, not from the cells of one anther, but from contiguous anther-cells of different anthers. Pollination entomophilous; the foot of the insect is caught in the cloven gland or slit, and when drawn upward, drags out and bears away the pollen-masses; in walking over other flowers, the insect's foot is again drawn through a slit, and the pollen-masses are left behind on the stigma, which is concealed beneath the cloven structure. Fruit of 2 follicles. Seeds with a silky tuft of hairs at the micropyle.

Stems twining.
Stamen-column without appendages; corolla-lobes cucullate.....1. ASTEPHANUS.
Stamen-column with appendages; corolla-lobes plane.
Appendages of the stamen-column attached at base, scale-like....2. PHILIBERTIA.
Appendages plate-like, uniting the stamen-column with a corolla-like crown.....
3. GONOLOBUS.
Stems never twining; stamen-column with appendages.
Corolla-lobes reflexed; hoods distinct, adnate to the stamen-column above the base.
Stems strongly flattened, prostrate.....4. SOLANOA.
Stems terete, commonly strictly erect, rarely decumbent.....5. ASCLEPIAS.
Corolla-lobes rotate; hoods inserted at base of stamen-column, joined to each other by a lobed disk.....6. ASCLEPIADORA.

1. **ASTÉPHANUS** R. Br.

Stems in ours slender, twining. Flowers small, in axillary umbels. Corolla short-campanulate, shortly 5-cleft, glabrous. Appendages of the corolla or stamen-column none. (Greek astephanos, crownless.)

756. A. utahensis Engelm.; fl. x 11.

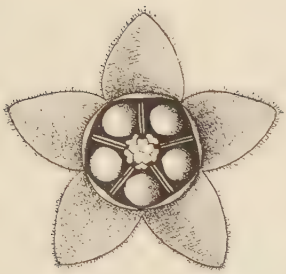
1. **A. utahénsis** Engelm. Fig. 756. Stems many from the crown of a taproot, diffuse or ascending, 9 to 15 in. long; herbage nearly glabrous; leaves narrowly linear, acuminate, ¾ to 1¼ in. long, spreading or often reflexed; umbels 7 to 16-flowered, the pedicels 2 to 3 lines long; flowers ochre-colored, 1 to 1¼ lines broad; calyx-lobes subulate or lanceolate; corolla glabrous, subcampanulate, shallowly cleft, its short lobes cucullate with the points inflexed, so that the throat is almost closed; stamen appendages none. —Gravelly valleys, Colorado Desert: Coyote Holes; San Felipe; e. to Ariz. and Utah.

2. **PHILIBÉRTIA** H.B.K.

Stems in ours twining. Flowers small, dull purplish or yellowish, borne in axillary umbels. Calyx and corolla 5-parted or -cleft. Corolla deeply lobed, with a membranous ring adnate to it at base, pubescent on the outside. Stamen-column short, with 5 scales at base. (J. C. Philibert, editor of a French dictionary of botany, 1804.)

Stamen appendages globose-ovate, broader than long, free from the corolla-crown; corolla purplish.....1. *P. heterophylla.*
Stamen appendages ovate or oblong, longer than broad, contracted below into a sort of pedicel which is joined to a narrow wing-like disk or crown on the base of the corolla-lobes; corolla greenish-yellow.....2. *P. hirtella.*

1. **P. héterophýlla** Jepson n. comb. Fig. 757. Stems 2 to 4 or 8 ft. long, climbing freely; herbage green, thinly puberulent or glabrous; leaves commonly linear (1 line wide), varying to lanceolate (5 lines wide), obtuse, acute or auriculately lobed at base, 1 to 2 in. long, shortly petioled; pedicels 3 to 6 lines long; flowers 4 to 5 lines broad; calyx-lobes ovate-lanceolate, very acute; corolla purplish, its lobes elliptic-ovate, purple-veined, 2 lines long; base of corolla bearing a narrow but distinct wing-like crown; stamen



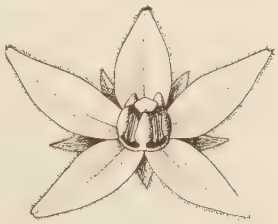
757. Philibertia heterophylla Jepson; fl. seen from above x 3.

appendages roundish-ovate, as broad or broader than long.—Interior valleys of coastal S. Cal.; e. to the Colorado Desert and Ariz. (Sarcostemma heterophyllum Engelm. Philibertia linearis var. heterophylla Gray.)

2. **P. hirtélla** Parish. Fig. 758. Stems running widely over the ground, often twining a little, 3 to 10 ft. long; herbage canescently puberulent; leaves linear to linear-lanceolate, acute or acutish at both ends, 1 to 3 in. long, 1 to 3 lines wide, shortly petioled; flowers greenish-yellow, 2½ lines broad; calyx-lobes linear-lanceolate; corolla-lobes ovate, 1 to 1¼ lines long; stamen appendages oblong to narrow-ovate, obtuse, longer than broad, abruptly contracted into a pedicel-like structure which is joined to a narrow wing-like disk on the base of the stamens.—Desert washes: Colorado Desert; e. Mohave Desert; Inyo Co.; e. to Ariz. and southern Nev. (Philibertia linearis var. hirtella Gray.)

3. GONÓLOBUS Michx.

Ours twining herbs with opposite leaves. Flowers similar to Philibertia, in axillary umbels or in ours commonly solitary. Base of corolla (in ours) bearing a cup-like crown attached to the stamen-column by thin plates. Anthers (in ours) with thin scarious appendages inflexed over the summit of the stylar disk. (Greek gonia, angle, and lobos, pod, one of the early species with angled fruits.)



758. Philibertia hirtella Parish; fl. x 6.

1. **G. califórnicus** Jepson n. sp. Stems much branched, freely twining, 8 to 14 in. long; herbage puberulent; leaves cordate-sagittate, tapering-acuminate, 3 to 5 lines long, on petioles ½ to ⅔ as long; flowers 1 or rarely 2 in the axils, on pedicels ¼ to ½ line long; peduncles none; flowers dull greenish, 2 lines long; calyx-lobes narrowly lanceolate, obtusish; corolla subrotate, deeply parted into oblong or short-lanceolate lobes, pubescent on the inside; sinuses of the corolla with short but distinct processes downwardly produced; corolla-tube bearing at base a 5-lobed corolla-like crown which is united to the stamen-column by 5 thin vertical lamellae, the crown thus, as it were, 5-celled and nearly equaling the stamen-column.—Sw. Colorado Desert (Ironwood Well, T. Brandegee, type). Apr. Possibly the lobes of the organ here called corolla-crown can be interpreted as hoods but the structure, in any case, is as described.

4. SOLÁNOA Greene

Stems strongly flattened. Umbels small, terminal, globose, densely many-flowered, the peduncles longer than the pedicels. Flowers purplish-red outside, flesh-color within. Hoods cleft dorsally from top to bottom, the ventral side adnate to the stamen-column. Horns none. (The Indian chief, Solano, of the Suisunes.)

1. **S. purpuráscens** (Gray) Greene. Stems 2 or 3 from a stout taproot, about 1 ft. long, prostrate, flexuous, purplish and purple-dotted; herbage canescently-puberulent; leaves thick, the lowermost elliptic-ovate, the upper broadly cordate-ovate, 1 to 2 in. long; umbels 2; flowers purplish-red outside, flesh-color within, about 2 lines long; follicles 2 in. long, about 5 lines in diameter at the widest part.—Montane dry or rocky slopes: North Coast Ranges from the Mayacamas Range to the Yollo Bolly Mts. (Gomphocarpus purpurascens Gray.)

5. ASCLÈPIAS L. Milkweed

Herbs with stems commonly erect, arising from thick deep-seated roots. Bracts of the involucre usually subulate. Calyx and corolla divisions re-

flexed, those of the former small, persistent, those of the latter deciduous. Filament-column bearing a circle of 5 hoods, each containing an incurved horn, or hornless. Anther wings (forming the sides of the cloven gland) widened towards the truncatish base. Follicles ovate or lanceolate, one often abortive, erect or ascending, or pendulous or descending in A. subulata. Seeds anatropus, flat, margined, imbricated on the large placenta. Embryo large, with broad foliaceous cotyledons in thin endosperm. (Greek name of the European swallow-wort, a plant of this family.)

Horns present.
- Hoods equaling or shorter than the anther-column; stems erect.
  - Leaves broad; filament-column very short or almost none; follicles erect or ascending, on deflexed pedicels.
    - Lateral umbels sessile, the terminal one peduncled; hoods truncatish, a pair of slender teeth inserted between them on the stamen-column; horns wing-like, attached by their whole length to the dorsal side of the hoods within, not exserted ..... 1. *A. vestita.*
    - Umbels peduncled; herbage woolly; hoods more or less truncate, sometimes obliquely so, no teeth-like processes between them.
      - Umbels on peduncles longer than the pedicels; horns crest-like, attached dorsally all the way to the summit of the hood, the acute or sickle-shaped apex barely projecting or included; anthers sessile or nearly so ..... 2. *A. eriocarpa.*
      - Umbels on peduncles shorter than the pedicels; horns attached below the middle of the hood, well exserted.
        - Horns attached below middle of hood, strongly exserted from the hood, curving over the disk of the stigma; filament-column obvious ..... 3. *A. erosa.*
        - Horns attached at base of hoods, only a little exserted from the hood, ending in a subulate point; filament-column very short ..... 4. *A. fremontii.*
  - Leaves narrow; follicles erect, on erect pedicels.
    - Stems very leafy; herbage glabrous; hoods rounded at apex, the horns much exserted; filament-column about as long as the anther-column .... 5. *A. mexicana.*
    - Stems naked at flowering time, the leaves early deciduous; hoods truncate at apex, the horns scarcely exserted; filament-column shorter than the anther-column ..... 6. *A. albicans.*
- Hoods twice or thrice as long as the anther-column; filament-column very short or none; pedicels deflexed in fruit.
  - Hoods open, long-lanceolate above the broad base, very conspicuous ..... 7. *A. speciosa.*
  - Hoods with the sides closely appressed, the horn a wing-like crest attached towards the apex.
    - Leaves broad; stems decumbent ..... 8. *A. nyctaginifolia.*
    - Leaves narrow or none; stems erect, rush-like ..... 9. *A. subulata.*

No horns to the hoods; pedicels deflexed in fruit.
- Hoods rounded, cleft half-way down the back, shorter than the anther-column; filament-column long; herbage white-tomentose ..... 10. *A. californica.*
- Hoods conical, open down the front, a little exceeding the anther-column; filament-column short; herbage glabrous ..... 11. *A. cordifolia.*

1. **A. vestita** H. & A. Fig. 759. Stems ascending, 2½ to 3 ft. high; herbage white woolly, the wool at length largely deciduous; leaves opposite, ovate or mostly oblong-lanceolate, often subcordate at base, 2 to 6 in. long, the upper more acuminate, all short-petioled or the upper sessile; umbels 1 to 4, the lateral sessile, the terminal peduncled; corolla yellowish white or purplish, tomentose on the outside, its lobes 3 lines long; hoods truncate at summit and entire, auriculate-lobed or acute at the inner angle and open down the front, not exceeding the stamen-column; cloven glands with a pair of linear teeth inserted beneath them on the stamen-column; horn or crest blunt, not exserted, attached to the back of the hood from the base to the summit, produced upward and forward into a short blunt point.—Dry valleys: Mohave Desert; n. to Inyo, San Joaquin and Monterey Cos. Var. PARÍSHII Jepson n. var. Leaves narrower, very acuminate glabrate; corolla purple; teeth beneath the cloven glands much reduced.—Desert side of the San Bernardino Mts. (Cajon Pass, Jepson 6116, type; Rabbit Sprs., S. B. Parish).

759. Asclepias vestita H. & A.; fl. x 1⅛.

2. **A. ériocárpa** Benth. Stem 1½ to 3 ft. high, more or less sharply angled below; herbage hoary-tomentose, in age more or less deciduous; some of the leaves in whorls of 3 or 4, all broadly oblong with truncate or subcordate base, rounded or

acute at apex, 4 to 7 (or 9) in. long, very short-petioled; umbels few or several, mostly corymbose-clustered toward the summit, on peduncles equaling or rather longer than the pedicels; flowers 3½ lines long; corolla creamy-white; hoods pink or purplish tinged, shorter than the stamen-column, roundish, truncatish at top, as if closed, but with a narrow slit which often extends a short distance down the back; horn broad-based, attached behind by its entire base to the hood, at apex acute or sickle-shaped, projecting forward but little protruded from between the acute teeth of the hood.—Dry barren valleys, 100 to 2000 ft., or up to 5500 ft. southward: Coast Ranges; Sierra Nevada foothills; s. to coastal S. Cal. and L. Cal. July-Aug. It is said to poison sheep.

3. **A. eròsa** Torr. DESERT MILKWEED. Stems 2 to 3½ ft. high; herbage finely white-woolly, eventually more or less glabrate; leaves in opposite pairs, ovate-lanceolate, 5 to 7 in. long; pedicels 1 to 1¼ in. long, exceeding the peduncles; flowers very pale cream-color or greenish; hoods when outspread orbicular-obovate with rounded entire or truncatish summit, scarcely exceeding the stamen-column; horns broadly falcate, attached below the middle, exserted from the hood and incurving over the central disk.—Dry hills: Kern and Inyo Cos. through the Mohave Desert and s. to San Diego Co.; e. to Utah. Horns shaped much like an inverted Lupine keel.

4. **A. fremóntii** Torr. KOTOLO. Stems ½ to 2 ft. high; herbage woolly with a felt-like tomentum, more or less glabrate; umbels 1 or 2 to several, all peduncled; peduncles not longer than the pedicels; corolla whitish or pink-tinged; hoods yellowish, nearly erect, equaling the stamen-column, evenly truncate, or somewhat obliquely truncate (and thus making a notch behind), open down the front; horn or crest broad, with the inner angle produced into a subulate apex, attached to the hood below the middle, obviously exserted.—Marysville Buttes; Lake Co. It is too little known.

5. **A. mexicàna** Cav. NARROW-LEAF MILKWEED. Fig. 760. Stem slender, 2 (sometimes to 5) ft. high; herbage glabrous; leaves linear to linear-lanceolate, in whorls of 3 to 6, or the lower and uppermost opposite, 2½ to 6 in. long, 2 to 6 lines broad, short-petioled; umbels many, often in whorls or corymbose, densely many-flowered, on peduncles longer than the pedicels; flowers small, greenish-white or tinged with purple; corolla-lobes oblong, 2 lines long; hoods about equaling the stamen-column; horns slender, subulate, exserted and incurved over the summit of the disk; follicles 3 to 4 in. long, about 4 lines thick at the widest part; seeds 3½ lines long.—Forming colonies in dry ground, valleys and foothills almost throughout Cal., but not on the immediate coast n.; Ore. to Nev., Ariz. and Mex.

760. Asclepias mexicana Cav.; *a*, fl. branchlet x ½; *b*, hoods and stamen-column seen from above x 2; *c*, fl. x 2.

6. **A. álbicans** Wats. Stems 3 to 6 ft. high; herbage glabrate, the pedicels pubescent; leaves in 3s, narrowly linear, early deciduous; peduncles ½ to 1 in. long; pedicels 6 to 7 lines long; corolla greenish-brown; hoods yellowish, shorter than the anthers, truncate, acutish at the inner angle, the subulate upcurved horn scarcely exserted; pedicels and follicles erect, the latter 4 in. long.—Colorado Desert: Pinto Mts.; Agua Caliente, e. San Diego Co.; s. to L. Cal.

7. **A. speciòsa** Torr. Stem stout, 2 to 4½ ft. high, leafy to the top; herbage soft-tomentose, or rarely glabrate in age; leaves opposite, oval to ovate or oblong, transversely veined, acute or obtuse. 4 to 6 in. long; petioles

3 to 5 lines long; peduncle longer than the woolly pedicels; lower umbels with 6 to 10 flowers, the upper with 18 to 55; corolla pink or reddish-purple; hoods yellowish with a broad involute base, above this abruptly contracted into a nearly flat lanceolate portion, the whole fully twice as long as the stamen-column; horns much exserted, incurved over the central disk; follicles soft-spiny, at least toward the apex.—Valley flats and along streams, 150 to 4500 ft.: Coast Ranges from Alameda Co. to Siskiyou Co.; Sierra Nevada foothills from Fresno Co. to Plumas Co.; Inyo Co.; e. to Ark., n. to Wash.

8. **A. nyctáginifòlia** Gray. Stems several from the base, decumbent or ascending, 6 to 8 in. long; herbage green, finely puberulent; leaves ovate, acute, 2 to 4 in. long on petioles ½ to 1 in. long; umbels subsessile; corolla thinnish, greenish; hoods narrowly oblong, over twice as long as the stamen-column, the sides closely appressed; horn wing-like, attached towards the apex and produced into a subulate exserted point; follicles narrowly ovate, attenuate, 2 to 2½ in. long.—E. Mohave Desert (Providence and New York mountains); e. to Ariz.

9. **A. subulàta** Dec. Stems in clusters, erect, straight, rush-like, leafless or with a few filiform leaves, 3 to 5 ft. high; herbage glabrous; flowers dull yellowish-white; hoods elongated, twice the length of the stamen-column, the 2 sides pressed together like a lupine keel and somewhat scimitar-shaped in outline; horn a thin wing, borne above the middle, its short sharp point scarcely exserted from the folded hood; follicles slender, long-acuminate, 2 to 5¼ in. long.—Desert washes or low depressions: e. Mohave Desert; n. Colorado Desert (especially along Colorado River); s. to L. Cal., n. to southern Nev.

10. **A. californìca** Greene. Vegetative aspect of no. 1; stems 12 to 22 in. high, the stems persistently white-tomentose, the tomentum on the leaves largely deciduous; leaves opposite, oval to ovate or oblong-lanceolate, sharply acuminate, 1½ to 3 in., the lower to 6 in. long; umbels nearly sessile, about 6 to 9-flowered; corolla purplish; hoods dark maroon, semi-orbicular, laterally compressed, centrally attached and reaching nearly to the middle of the anthers, 2-cleft half-way down the back and destitute of horn.—South Coast Ranges; Sierra Nevada in Tulare Co.; s. to San Diego Co.; L. Cal. (Gomphocarpus tomentosus Gray.)

761. Asclepias cordifolia Jepson; fl. x 2.

11. **A. cordifòlia** (Benth.) Jepson. PURPLE MILKWEED. Fig. 761. Stems 1½ to 2½ ft. high; herbage green and more or less purplish, perfectly glabrous; leaves mostly opposite, rarely in 3s, ovate-lanceolate, with the lower round or elliptic-ovate, the upper ovate to ovate-lanceolate, all with cordate-clasping base, 2 to 4 in. long; umbels loosely many-flowered, the filiform pedicels equaling or shorter than the peduncles; corolla dark red-purple, its lobes 3 to 4 lines long; hood purplish, oblong, the summit obliquely truncate dorsally and produced at the ventral margins into an ascending cusp, the fissure down the front narrow; follicles glabrous, 2 to 5 in. long, often long-attenuate.—Open slopes, from the foothills (500 ft.) up to 5000 ft.: North Coast Ranges; Sierra Nevada as far s. as Mariposa Co.; w. Nev. (Gomphocarpus cordifolius Gray.)

6. ASCLÈPIADÒRA Gray

Stems low and stout. Leaves alternate. Corolla rotate, the ovate lobes greenish, rotate-spreading. Hoods inserted at base of the stamen-column, narrow and elongated, the sides involute-approximate so as to form a sort of tubular process which is incurved at apex and somewhat hooded, the apical cavity bearing a deltoid crest or wing ending in a short acute point; bases of hoods joined to each other by a disk or ring of undulate lobes opposite the glandular slits. Anther wings widest at the middle. (Greek Asklepios, and doron, gift, the gift of Aesculapius.)

1. **A. decúmbens** Gray. Stems decumbent or ascending; herbage green, scabrous-puberulent; leaves elongated linear-lanceolate, (3 or) 4 to 6 in. long, short-petioled; corolla 5 lines broad; hoods purplish, overtopping the stamen-column.—Providence Mts., e. Mohave Desert; e. to Ark.

CONVOLVULÀCEAE. Morning-glory Family

Chiefly twining or trailing herbs. Leaves alternate, or the plants leafless parasites. Flowers complete and perfect. Sepals 5, distinct or nearly so, imbricated, persistent, often unequal. Corolla regular, usually showy, more or less campanulate, mostly shallowly 5-lobed, commonly folded longitudinally and twisted in the bud. Stamens 5, borne on the corolla, included. Pistil 1; ovary superior, 2 (rarely 1) -celled, with 2 ovules (rarely 1) in each cell. Styles 1 or 2. Fruit most frequently a capsule, 1 to 4 (or 6) -seeded. Embryo with folded cotyledons. The embryo of Cuscuta is filamentous and sometimes destitute of cotyledons.

Ovary deeply 2-parted; styles 2, distinct or united at base only; creeping herbs; corolla-lobes imbricate in the bud.....1. Dichondra.
Ovary entire.
  Style 1, entire or cleft at the apex only; corolla plicate and twisted in the bud; prostrate or twining herbs, one species woody.
    Stigma filiform or ovate.....2. Convolvulus.
    Stigma capitate.....3. Ipomoea.
  Styles 2, distinct; corolla-lobes imbricate in the bud.
    Erect non-twining leafy herb.....4. Cressa.
    Leafless twining parasites.....5. Cuscuta.

1. DICHÓNDRA Forst.

Perennial herbs with slender creeping stems and very small obscure flowers near the surface of the ground. Leaves reniform, entire, with very short 1-flowered peduncles in the axils. Calyx deeply 5-parted. Corolla 5-cleft, the lobes imbricated in the bud. Stamens short. Ovary deeply 2-lobed, separating when ripe into 2 one-seeded utricles which sometimes break open irregularly. Styles 2, in ours distinctly united at base. (Greek, di, double, and chondra, grain, on account of the deeply parted and twin fruit.)

1. **D. rèpens** Forst. Stems whitish-pubescent, rooting freely; leaves green and mostly glabrous, ½ to 1½ in. wide, on long peduncles with 2 small bracts at base; calyx thinnish, 1 to 1½ lines long; corolla purple, edged with white, or about the same length; ovary densely white-hairy; styles united at base.—Nat. from the tropics and found in scattered localities: Eldorado Co. foothills; San Francisco; Del Mar; San Diego.

2. CONVÓLVULUS L. Bindweed. Morning-glory

Twining or prostrate herbs, ours perennial except one. Corolla funnelform to campanulate. Style entire, or cleft at the apex only. Stigmas ovate to linear. Capsule globose with 4 seeds in 2 cells (or by abortion 1-celled), mostly 2 to 4-valved. (Latin convolvo, to entwine.)

Flowers showy, (¾ or) 1 to 2½ in. long; leaves commonly sagittate except in no. 1; perennial.
  Calyx subtended by a pair of bracts; bracts large, ovate to orbicular, embracing and commonly enclosing the calyx.
    Flowers pink, purple or lavender, 1¾ to 2½ in. long.
      Leaves broadly reniform, ¾ to 2 in. broad; slightly succulent seaside herbs. 1. *C. soldanella.*
      Leaves long triangular-sagittate, 2½ to 3½ in. long; minutely puberulent climber of swampy or boggy places.....2. *C. sepium.*
    Flowers white or cream color (sometimes pink or purple in no. 4).
      Leaves usually triangular-hastate to ovate-lanceolate; herbage glabrous or nearly so.
        Leaves as broad or broader than long, broadly triangular; corolla 1½ to 2 in. long; coastal islands.....3. *C. macrostegius.*
        Leaves longer than broad, almost lanceolate-sagittate; corolla ½ to 1½ in. long; along the south coast.....4. *C. occidentalis.*
      Leaves ovoid-deltoid, sagittate to almost truncate at base.
        Herbage glabrous; corolla 1½ in. long; low herbaceous plant; n. Cal... 5. *C. atriplicifolius.*
        Herbage more or less pubescent.
          Leaves thin, slightly hairy; corolla 1¾ to 2 in. long; low tufted plants, the leaves and peduncles basal; cent. Coast Ranges.....6. *C. subacaulis.*

Leaves thick, almost felty, covered with a dense villous to almost tomentose pubescence; corolla small, 1 to 1½ in. long. Low trailing plants of Coast Ranges and Sierra Nevada foothills; leaves small, triangular-deltoid, ½ to 1 in. long; bracts white-tomentose.....7. *C. villosus.*
Coarse climbing plants of the Sierra Nevada at middle altitudes; leaves large, orbicular-deltoid; bracts tawny. 8. *C. chartaceus.*

Calyx with the bracts more or less distant.
Bracts sagittate (like the leaves), inserted about ¼ to ½ in. below the calyx; corolla 1 to 1½ in. long, white; slender erect plants, slightly pubescent throughout.....9. *C. fulcratus.*
Bracts narrowly ovate to lanceolate (without basal lobes as in the leaves).
Bracts inserted less than their length below the calyx.
Low herbaceous plants; herbage minutely puberulent; leaves ½ to 1 in. long; corolla yellowish, 1 in. long.....10. *C. polymorphus.*
Large woody climbers; herbage glabrous or nearly so; leaves 1 to 3 in. long; corolla white or purple, 1 to 2 in. long...11. *C. luteolus.*
Bracts distant twice or at least more than their length below the calyx; leaves ½ to 2 in. long.
Stems erect and feebly twining; leaves linear-hastate; corolla white, 1 in. long.....12. *C. longipes.*
Stems prostrate; leaves elliptic or oblong-sagittate, very obtuse; corolla purplish, 8 to 10 lines long.....13. *C. arvensis.*
Flowers small, 3 lines long; leaves linear- to oblong-oblanceolate, not sagittate; annual.... 14. *C. pentapetaloides.*

1. **C. soldanélla** L. SHORE MORNING-GLORY. Stems prostrate, ½ to 1½ ft. long; herbage glabrous and slightly succulent; leaves thick, decidedly reniform, deep green and shining, ¾ to 1 or 2 in. broad, mostly broader than long, the petioles stout, as long to twice as long; calyx enclosed in broad membranous bracts 4 to 6 lines long, and about as broad as long; corolla broadly funnelform, 1½ to 2½ in. broad and about half as long as broad, pinkish or pale purple.—Sandy sea-beaches along the coast of Cal. and most Pacific shores.

2. **C. sépium** L. HEDGE BINDWEED. Stems from a slender horizontal rootstock, often several ft. long, climbing on herbaceous plants or trailing; herbage densely soft-puberulent; leaves large, 2½ to 3½ in. long, ovate-lanceolate, acuminate at apex, hastate at base, on slender petioles shorter than the blade; peduncles often longer than the leaves, 1-flowered; bracts ½ to ¾ in. long, ovate, acuminate at apex, cordate at base, completely enclosing the calyx; corolla pink, 2 to 2½ in. long.—Native of Europe, introduced in swampy land at Los Angeles and San Bernardino; rarely collected.

3. **C. macrostègius** Greene. Suffrutescent with long trailing stems 6 to 15 ft. long; herbage glabrous throughout; leaves broadly triangular, hastate, 1 to 2 or 3 in. long, rather longer than or about equaling the petioles; peduncles 3 to 8 in. long, 1 to 7-flowered; buds enclosed in a pair of large membranous bracts ½ to ¾ in. long, the lateral flowers each similarly bracted within the outer bracts; corolla pale yellow, 1½ to 2 in. long.—Santa Cruz, San Clemente and Guadalupe Isls.

4. **C. occidentàlis** Gray. Stems freely twining, often several feet long; herbage glabrous or nearly so; leaves very variable in shape, ¾ to 1½ in. long, the blade about twice as long as the slender petiole, usually triangular-ovate, acuminate at apex and cordate-sagittate to hastate at base, the basal lobes often 1 or 2-toothed; peduncles elongated, 2 to 3 or 4 in. long, greatly surpassing the leaves, 1 or often 2 or 3-flowered; involucral bracts long-ovate, acuminate, ½ to ¾ in. long; corolla white or pinkish, ½ to 1½ in. long and about as broad.—Dry hills, 20 to 2000 ft., coastal S. Cal. Var. TENUÍSSIMUS Gray. Leaves very narrow, lanceolate-sagittate; peduncles 1 or 2-flowered; bracts 4 to 6 lines long, barely if at all exceeding the calyx.—Coastal S. Cal. Var. CYCLOSTÈGIUS Jepson n. comb. Bracts orbicular, mucronulate, purplish.—Coast form, San Francisco Bay region to San Diego Co. (C. cyclostegius House.)

5. **C. atriplicifòlius** House. Low, herbaceous, the stems 1 ft. or less long, arising from a fleshy slender rhizome; herbage glabrous; leaves broadly triangular-hastate, 1 to 1½ in. long and about as broad, abruptly acute at apex and with an abruptly diverging hastate lobe on either side of the cuneately tapering base; flowers few, in the axils of the lower leaves;

762. Convolvulus subacaulis Greene; *a*, habit x ½; *b*, *d*, stamens x 1; *c*, pistil x 1.

peduncles ⅞ to 1½ in. long, about equaling the petioles; involucral bracts oval, obtuse or almost truncate, about 6 lines long, slightly exceeding or equaling the obtuse and mucronate sepals; corolla 1½ in. long, white or pinkish.—Lake Co.; Butte Co.; n. to Wash.

6. **C. subacaúlis** Greene. Fig. 762. Stems 1 to 15 in. long, when short, erect, when longer, trailing, or frequently acaulescent; leaves thin, more or less hairy with somewhat appressed hairs, ovoid or roundish-deltoid, truncate or sometimes slightly cuneate or subcordate at base and either with or without divergent hastate lobes at the angles, mostly ¾ to 1½ in. long; petioles elongated, mostly 2 to 3 times as long as the leaves; peduncles 1-flowered, ¼ to 1 in. long; bracts ovate, obtuse, ¼ to ½ in. long, embracing but not enclosing the calyx; corolla campanulate-funnelform, angularly 5-lobed, 1½ to 2¼ in. long, white or cream-color with a purplish exterior.—Dry hills, 100 to 1500 ft., San Luis Obispo Co. to Solano Co. Var. DOLÒSUS Jepson n. var. Fig. 762d. In habit and in flower like the species in every way save that the filaments bear a pair of teeth near the middle; filaments sparingly glandular short-hairy at base.—Berkeley Hills (Jepson 9719a, type).

7. **C. villòsus** Gray. WOOLLY MORNING-GLORY. Fig. 763. Stems herbaceous, ascending or trailing, 3 in. to 1 ft. long, from fleshy but slender rootstocks; herbage very hoary with a dense velvety or plushy pubescence; leaves triangular-hastate, ½ to 1 in. long and as broad as long; petioles, except basal ones, usually but not always shorter than the leaves; peduncles 1-flowered, short on the trailing branches, long ones at base, often flexuous or curved, especially in age; involucral bracts enclosing the calyx, triangular-ovate, 6 lines long; corolla funnelform, 1 to 1½ in. long, cream-color.—Dry slopes and ridges, 1000 to 5500 ft.: Coast Ranges; Sierra Nevada. (C. malacophyllus Greene.) Var. PÉDICELLÀTUS Jepson n. var. Trailing; leaves more narrowly acuminate; flowers long-pediceled.—Santa Lucia Mts.; Santa Paula (Cobb 138, type).

8. **C. chartàceus** Jepson n. sp. Stems coarsely herbaceous, ascending or trailing, 1 to 1½ ft. long;

763. Convolvulus villosus Gray; *a*, habit x ½; *b*, leaf x ½; *c*, pistil x 1.

herbage hoary throughout with a dense velvety or plush-like pubescence; leaves large, orbicular-deltoid to broadly reniform, obtuse or slightly mucronate at the broad apex, 1 to 2 in. long and twice as broad, little or not at all lobed at base; lower petioles elongated, often twice as long as the leaves, upper ones usually shorter than the leaves; axils of the middle and lower leaves bearing a flexuous or recurved one-flowered peduncle; involucral bracts large, papery and conspicuous, tawny or straw-color in age, entirely enclosing the calyx, triangular-ovate to almost orbicular, 8 to 9 lines long and 4 to 6 lines broad; sepals narrowly ovate-acuminate, 3 to 6 lines long; corolla creamy white to pale yellow, 1 to 1½ in. long, broadly funnelform. —Middle altitudes, 4500 to 6500 ft.: Sierra Nevada from Nevada Co. to Tulare Co. (Toll House to Hazel Green, Mariposa Co., Jepson, type.)

9. **C. fulcrátus** Greene. Slender plants with fibrous roots; stems 10 to 18 in. high, not twining except feebly at the sterile leafy summit above the flowers; herbage minutely puberulent to almost villous throughout; leaves ½ to 1 in. long, triangular-sagittate, the moderately divergent lobes often more than half as large as the main blade, the slender petioles ¼ to ¾ in. long; axils of the middle leaves each bearing an elongated filiform 1-flowered peduncle 1½ to 2½ in. long, this with a single pair of sagittate leaves (like the ordinary ones but smaller) about ¼ to ½ in. below the calyx; sepals unequal, broad, truncate, obtuse or mucronate, pubescent; corolla 1 to 1½ in. long, white or cream-color.—Sierra Nevada foothills, 1000 to 2000 ft., from Mariposa Co. to Tulare Co.; s. to San Diego Co. Var. DELTOÍDEUS Jepson n. comb. Leaves short and sharply deltoid, 3 to 6 lines long, about twice as broad as long, densely villous throughout.—Tehachapi and San Emigdio ranges. (C. deltoideus Greene.) Var. BÉRRYI Jepson n. comb. Plants coarser throughout; leaves large, triangular-sagittate, 1 to 2 in. long, much broader than in the species, as broad as long, densely villous, the basal lobes often scarcely at all developed.—Marble Fork, Kaweah River. (C. berryi Eastw.)

10. **C. polymórphus** Greene. Stems slender, erect or trailing, 1 to 2 ft. high, usually wholly herbaceous; sometimes feebly twining from the sterile leafy tips; herbage pale and puberulent throughout; leaves reniform-hastate to narrowly subsagittate, mucronate, ½ to 1 in. long; axils of the middle leaves bearing short peduncles; peduncles 1-flowered, equaling or somewhat exceeding the leaves; calyx subtended by a pair of narrowly elliptic bracts at a short distance below it, their tips enclosing the bases of the sepals; sepals very unequal, the outer often broadly ovate and truncate; corolla 1 to 1¼ in. long, white.—Siskiyou Co., e. to Modoc Co., s. to Lake Co.; n. to southern Ore.

764. Convolvulus luteolus Gray; *a*, sect. of fl. stem x ½; *b*, stamen x 1; *c*, pistil x 1; *d*, diagrammatic cross sect. of corolla in the bud x 1½.

11. **C. lutèolus** Gray. Fig. 764. Stems woody below, 2 or 5 to 20 ft. high, climbing over trees and shrubs; leaves glabrous and glaucous, or soft-pubescent beneath, 1 to 2 or 3 in. long, sagittate at base, the upper portion or terminal lobe varying from triangular to narrowly lanceolate; basal lobes large, very variable, sometimes nearly as large as the terminal lobe, angular, shallowly 2-lobed, or somewhat saliently and acutely lobed; petioles usually about the length of the leaves; axils of the

middle leaves bearing the peduncles, these filiform, 1 to 2 or 5 in. long, commonly 1 to 3 (or sometimes 5)-flowered; bracts subulate, lanceolate or oblong, acute, 2 to 5 lines long, distant their length to ½ their length from the calyx; sepals obtuse, unequal, coriaceous, the two outer ones short; corolla open-funnelform, usually white, exposed portion of the folds purplish, 1 to 1½ (or 2) in. long; limb not lobed, scarcely angular.—Along wooded streams or brushy slopes, 10 to 3500 ft.: Coast Ranges from Monterey Co. to Siskiyou Co.; Sierra Nevada foothills from Tulare Co. to Shasta Co. Var. SAXÍCOLA Jepson n. comb. Leaves reniform-orbicular; pedicels usually short.—Coast form at Bodega. (C. saxicola Eastw.) Var. PURPURÀTUS Greene. Corolla purple.—San Francisco Bay region.

12. **C. lóngipes** Wats. Stems erect, much branched, feebly twining, 1 to 3 ft. high; herbage glabrous throughout; leaves small, linear-hastate, ½ to 1½ in. long and 1 to 2 lines wide, lower leaves with well developed hastate lobes, upper leaves gradually reduced to linear bractlets, these occuring as bracts on the peduncle about ¼ to ½ in. below the flower; peduncles elongated, mostly 1-flowered sepals ovate, obtuse, often mucronate, the outer two shorter, giving the appearance of bracts; corolla 1 in. long, broadly funnelform, white or cream-color.—Arid or desert slopes, San Diego Co. to San Luis Obispo Co., thence e. to the southern Sierra Nevada; s. Nev.

13. **C. arvénsis** L. BINDWEED. ORCHARD MORNING-GLORY. Fig. 765. Stems prostrate, 1 to 3 or more ft. long, from perennial roots which descend to great depth; herbage minutely villous-pubescent or almost glabrous; leaves elliptic to oblong-sagittate, very obtuse, rarely acutish, ½ to 1 (or sometimes 2) in. long on petioles half as long; peduncles 1 to 2 in. long, commonly 1 (sometimes 2 or 3)-flowered, with a pair of subulate or narrowly spatulate bracts (1 to 2 lines long) near the middle; corolla white, purplish outside (8 or) 9 to 10 lines long, open-funnelform and neither lobed nor angled. — The most troublesome orchard and garden weed yet naturalized in Cal., especially obnoxious in the richest lands and moistest alluvial loams. Native of Eur. May-Oct.

765. Convolvulus arvensis L.; *a*, fl. stem x ½; *b*, another leaf form x ½; *c*, long. sect. of fl. x 1; *d*, long. sect. of ovary x 5.

14. **C. pentapétaloides** L. Diffusely branching annual, the branches 6 to 18 in. long; herbage minutely puberulent to almost hairy; leaves linear- or oblong-oblanceolate, obtuse at apex, narrowed to a petiole below, ¾ to 1½ (or 3½) in. long; peduncles shorter than the leaves, ¼ to ¾ in. long, 1-flowered, with a pair of small spatulate or subulate bracts 1 to 2 lines below the flower, retrocurved in fruit; sepals more or less hairy with subscarious margin; corolla purplish, 3 lines long, deeply 5-cleft.—Grainfields, lower San Joaquin Valley to San Diego Co.; nat. from Eur.

3. IPOMOÈA L. MORNING-GLORY

Twining or trailing herbs similar to Convolvulus. Calyx not subtended by bracts but the outer sepals commonly larger. Style entire; stigma capitate. (Greek ip, bindweed, says Linnaeus, and omoios, similar.)

1. **I. hirsùtula** Jacq. Annual; stems twining or trailing; herbage pubescent; leaves broadly ovate-cordate, 1½ to 3 in. long; peduncles 1 to 5-flowered; sepals narrow-oblong, acute, hirsute on lower half; corolla blue, purple or whitish, 1¼ to 2¼ in. long; ovary 3- rarely 2-celled.—Garden plant from trop. Am., nat. in coastal S. Cal.: Los Angeles; Riverside; San Diego.

4. CRÈSSA L.

Low canescent perennial herb with erect or diffuse non-twining stems. Corolla white, its tube oblong-campanulate, equaling the sepals; limb 5-parted. Filaments subulate, exserted from the throat of the corolla. Ovary 2-celled, 4-ovuled. Styles 2, distinct; stigmas capitate. Capsule by abortion often 1-seeded. (Greek Kressa, a Cretan woman.)

1. **C. crètica** L. ALKALI WEED. Commonly densely branched from the base, forming low tufted plants 3 to 10 in. high; leaves oblong-ovate, 2 to 4 or 5 lines long, almost sessile; flowers short-pediceled in the axils; sepals oblong-ovate, acute, 2 lines long; corolla 3 lines long, its lobes obong-ovate, about 1 line long, hairy outside; summit of ovary long-hairy.—Alkaline lands, Sacramento Valley to S. Cal.; e. to Ariz.; especially common in the San Joaquin Valley, often covering thousands of acres; sometimes broad areas of it do not flower or rarely. Distributed around the earth in warm regions.

5. CÚSCUTA L. DODDER

Annual leafless parasites, destitute of green color, with twining filiform stems. Flowers small, in lateral heads or clusters. Calyx colored like the corolla, deeply 5-cleft. Corolla campanulate or somewhat urn-shaped to short-tubular, with 5 lobes imbricated in the bud, and as many small scales or appendages inserted in the tube below the stamens, or none. Ovary globular, 2-celled, 4-ovuled. Styles 2, in ours distinct, persistent; stigma globose. Capsule 1 to 4-seeded, ours indehiscent. Embryo devoid of cotyledons. The germinating seed produces a twining stem; this becomes parasitic by means of suckers which penetrate the bark of the host. (Derivation doubtful.)

Capsule pointed or conical; scales present.
Scales dentate; flowers less than 1 line long; stems very fine or capillary; dry desert areas.....1. *C. denticulata.*
Scales deeply fringed; flowers 1 to 2 (or 3) lines long; stems usually coarse, sometimes slender.
Corolla-lobes about half as long as the cylindrical tube; flowers 2½ to 3 lines long; common in dense thickets; Coast Ranges and Sierra Nevada....
2. *C. subinclusa.*
Corolla-lobes about as long as or longer than the tube.
Calyx-lobes ovate-lanceolate, as long the corolla-tube; flowers 1½ to 2 lines long; abundant in saline marshes.....3. *C. salina.*
Calyx-lobes shorter than the corolla-tube; alfalfa fields.
Corolla 1 line long, broadly campanulate; calyx-lobes broadly lanceolate.
4. *C. indecora.*
Corolla 1½ to 2 lines long, narrow campanulate; calyx-lobes broadly ovate.....5. *C. racemosa.*
Capsule depressed-globose.
Scales present, deeply fringed; flowers usually less than 1 line long, merely enclosing the base of the conspicuous globose capsule; moist or wet places.....
6. *C. arvensis.*
Scales absent; flowers usually 1½ to 2 lines long (except in var.) and entirely enclosing the mature capsule; dry sandy ridges.....7. *C. californica.*

1. **C. dénticulàta** Engelm. Stems hairlike; flowers small, less than a line long, short-pediceled in small umbel-like clusters; tube of the short campanulate almost urn-shaped corolla included in the rounded denticulate lobes of the calyx; anthers oval, on very short filaments; scales narrow, reaching to the base of the stamens, denticulate at the rounded tip; capsule pointed, covered by the withered corolla, 1 or 2-seeded.—Mohave Desert and neighboring ranges; desert regions e. of the Sierra Nevada; e. to Utah.

2. **C. súbinclûsa** D. & H. Stems commonly stout; flowers 2½ to 3 lines long, sessile or short-pediceled, at length in large dense clusters ½ to 1½ in. thick; calyx-lobes overlapping, ovate-lanceolate, about ½ the length of the cylindrical corolla-tube; lobes of the corolla ovate-lanceolate, minutely crenulate, scarcely more than ½ the length of the tube; anthers oblong or oval, nearly sessile; scales narrow, fimbriate, opposite the stamens but reaching only to the middle of the tube; styles slender, mostly longer than the ovary; ovary capped by the withered corolla.—Common almost throughout Cal. on species of Rhus and other plants, including Aesculus californica, Sambucus glauca, Eriogonum nudum.

3. **C. salìna** Engelm. MARSH DODDER. Stems slender; flowers 1½ lines long; calyx-lobes ovate-lanceolate, as long as the shallow-campanulate tube of the

corolla and as the corolla-lobes; these ovate, denticulate, overlapping; filaments about as long as the oval anthers; scales fringed, mostly shorter than the tube, sometimes much reduced and on the base of the tube; styles equaling or shorter than the ovary; capsule surrounded by the withered corolla, mostly 1-seeded.—Very abundant on Salicornia and other saline herbs, entangling them with its webs of thread-like stems, which in spring color the salt marshes with small patches of gold: coastal S. Cal. to the Sacramento Valley and Humboldt Co.; n. to B. C., e. to Ariz. and Utah.

4. **C. indécora** Choisy. Stems rather stout, turning dark in age; flowers 1 line long or less, pediceled in loose cymes, more or less papillose; calyx-lobes ovate-lanceolate, acute, mostly shorter than the broadly campanulate corolla-tube; corolla-lobes triangular, minutely crenulate, spreading, about as long as the tube, their tips inflexed; scales ovate, erect, fringed; stamens slightly exserted, anthers and stigma often purple; capsule oblong, acute, enveloped by the withering corolla; seeds 2 to 4.—Low moist places; on Leguminosae and Compositae.

5. **C. racemòsa** Martius var. **chiliàna** Engelm. Stems slender, straw-color; flowers of thin texture, 1½ to 2 lines long, borne in loose racemose panicles; calyx very short, forming a shallowly lobed cup at base of corolla, the lobes broadly triangular-ovate, more or less acute; tube of corolla gradually widening upwards, deeply campanulate, lobes short, shorter than the tube, erect or slightly spreading, with inflexed acute tips; scales large, fringed; stamens always included; anthers not purple; capsule ovate or obovate, thickened at the apex and somewhat pointed.—Introduced in early days with seed of Medicago sativa, thus becoming a local pest in alfalfa fields; native of Chile.

6. **C. arvénsis** Beyrich. Stems pale; flowers small, sessile or nearly so in dense globose clusters ½ in. thick; calyx-lobes obtuse, broad, about equaling tube of the corolla; corolla 1 line long, with acuminate lobes and short broad tube, in age remaining at base of capsule; scales often exceeding the tube and deeply fringed; capsule depressed-globose; seeds 2 or 4.—Mostly moist or wet stations, widely distributed on Xanthium canadense, Trifolium pratense, etc.

7. **C. califórnica** Choisy. Stems capillary; flowers small, 1 to 1½ lines long, in loose cymes; pedicels frequently much thickened below the flower; calyx-lobes with short-attenuate spreading tips; corolla-lobes lanceolate-subulate, equaling or longer than the campanulate tube, mostly reflexed in anthesis; scales none, sometimes represented by inverted arches or V-shaped thickenings alternating with the stamens, but situated near the base of the tube; anthers linear-oblong, nearly or quite equaled by the filaments; styles slender, mostly longer than the ovary; capsule depressed-globose, mostly 2 or 3-seeded.—Widely distributed in Cal., most frequent in S. Cal. on Eriogonum and Adenostoma. Var. BRÁCHYCÀLYX Yuncker. Flowers very small, 1 line long or less; calyx very short, less than half the length of the broadly campanulate corolla-tube.—Solano Co. to Humboldt Co., on Eriogonum and Ceanothus.

POLEMONIÀCEAE. Gilia Family

Herbs, or a few species somewhat woody at base. Leaves alternate or opposite, entire, lobed or divided, or pinnately compound. Flowers complete, 5-merous, either solitary, in loose clusters, capitate, racemose, corymbose or paniculate. Calyx persistent, regular or irregular. Corolla sympetalous, regular, its lobes convolute in the bud. Stamens 5, inserted on corolla, alternate with its lobes, often unequal in length. Ovary superior, 3-celled; style 3-cleft or with 3 stigmas. Capsule loculicidally 3-valved.—Langloisia has an irregular corolla. Some species of Navarretia have a 1-celled capsule, a 4-valved capsule or a 4-merous corolla. The seed-coats sometimes emit spiricles or become mucilaginous when wetted.

Plants with foliage leaves.
Corolla regular.
Calyx not ruptured by the growing capsule, growing as the capsule grows.
Calyx wholly herbaceous, the sinuses not distended; leaves pinnately compound; ours perennials, one species annual.....1. POLEMONIUM.

Calyx with membranous intervals between the angles or ribs, the sinuses distended into a revolute lobe; leaves simple (entire, cleft or pinnatifid); annuals.....2. COLLOMIA.
Calyx more or less distended by the capsule and usually ruptured by it; calyx scarious in the intervals between the ribs (except sometimes in no. 8).
Corolla strictly salverform, the tube distinctly contracted at the throat; leaves opposite (sometimes alternate above), entire.....3. PHLOX.
Corolla funnelform to salverform or campanulate, the throat open.
Calyx-lobes unequal and pungent; leaves all alternate, rarely some lower opposite, the lobes commonly pungent or spinescent.
Anthers oval; bracts green or chartaceous or coriaceous, hairy or glabrous; annuals, mostly of summer or late spring in dry ground.....4. NAVARRETIA.
Anthers sagittate; bracts embedded in white wool and nearly concealed; perennials or annuals.....5. HUGELIA.
Calyx-lobes equal, rarely pungent.
Leaves, at least the upper, alternate, entire to cleft, pinnatifid or pinnately or bi-pinnately lobed, parted or divided; annuals (or, in ours, 2 species perennials), mostly of spring.....6. GILIA.
Leaves opposite and palmately parted, or sometimes simple and opposite.
Slender annuals, mostly low hills or valleys, mostly of spring; calyx scarious in the intervals below the sinuses...7. LINANTHUS.
Perennials, often woody-based with pungent leaves; mostly montane; calyx below sinuses scarious or not scarious.....8. LEPTODACTYLON.
Corolla markedly 2-lipped or the 5 equal lobes somewhat obscurely disposed in 2-lipped fashion; low annuals, the leaves with long bristles; deserts.....9. LANGLOISIA.
Plants without proper foliage leaves, the simple stem bearing persistent cotyledons and a whorl of involucral leaves connate at base; diminutive annuals.....10. GYMNOSTERIS.

1. **POLEMÒNIUM** L. JACOB'S LADDER

Herbs. Leaves alternate, pinnate, the leaflets sessile. Flowers showy, blue, pink or white, in racemes, cymes or panicles. Calyx herbaceous throughout, not scarious below the sinuses, more or less accrescent and loosely investing the capsule. Corolla from tubular-funnelform to nearly rotate. Filaments equally inserted, more or less declined and hairy at base. Seeds few or several in each cell, becoming mucilaginous when moistened. (Greek name used by Dioscorides, from polemos, war, the application not obvious.)

KEY TO THE SPECIES BY H. L. MASON

Annuals; corolla equaling or shorter than the calyx; sepals spreading...1. *P. micranthum*.
Perennials; corolla longer than the calyx; sepals erect.
Flowers in a raceme or panicle; corolla-lobes equaling or longer than the tube; leaflets entire.
Style longer than the corolla; corolla 4 to 7½ lines long, blue; montane.
Herbage glandular throughout; stems short, several from a caespitose base. 2. *P. pulcherrimum*.
Herbage glabrous at the base, glandular in the inflorescence; stems tall, mostly solitary from a horizontal rootstock.....3. *P. occidentale*.
Style shorter than the corolla; corolla 8 to 10 lines long, pink; along coast.....4. *P. carneum*.
Flowers in capitate congested heads; corolla-lobes shorter than the tube; leaflets palmately cleft or divided
Style equaling the calyx in length; stamens not exserted; var. eximium of.....5. *P. confertum*.
Style longer than the calyx; stamens exserted.....6. *P. chartaceum*.

1. **P. micránthum** Benth. Stems 1 to numerous from the base, commonly branched, erect or ascending, 4 to 8 in. high; herbage viscid-puberulent to glabrous; leaves about 1 to 2 in. long; leaflets 5 to 15, elliptic to linear or lanceolate, 1 to 2 lines long; flowers solitary, opposite the leaves, the inflorescence thus a loose false raceme; pedicels slender, 3 to 10 lines long; corolla white, subrotate, shorter than or not exceeding the calyx; calyx 2½ to 3½ lines long, nearly twice as large in fruit and becoming chartaceous, the lobes tending to spread; style very short; cells of the ovary 2 or 3-ovuled. —Dry open ground, 2000 to 4500 ft.: Tehachapi Mts.; Siskiyou and Modoc Cos.; n. to Wash.

2. **P. pulchérrimum** Hook. Stems few to many, erect or ascending, 3 to 10 in. high, arising from the crown of a running rootstock; herbage viscid-pubescent or pilose; leaves basal and cauline, 1 to 6 in. long; leaflets 11 to 21

(the cauline with fewer leaflets), oblong or elliptic, 4 to 8 lines long; flowers in close racemose cymes; corolla pale blue or purple with a yellow or white throat, cleft to below the middle, 2½ to 5 lines long, 1¼ to 2 times as long as the calyx; calyx little accrescent; stamens included, the filaments hairy at base; style slightly exserted; cells of the capsule 1 to 3-seeded.—Moist shaded places in the mts., often in pine woods, 6000 to 10,000 ft.: Fresno Co. to Siskiyou Co.; n. to Wash., e. to Rocky Mts. Var. PARVIFÒLIUM Nels. Leaves tending to be glabrous and firmer in texture, 1 to 2 in. long; leaflets ovate or oblong-ovate, 1 to 3 lines long; inflorescence looser.—High montane, 6000 to 10,800 ft.: Mariposa Co. to Siskiyou and Trinity Cos. (P. parvifolium Nutt.)

3. **P. occidentàle** Greene. Stem erect, simple, solitary from a running rootstock, 1¼ to 3¼ ft. high; herbage glabrous below, glandular towards the inflorescence; leaves nearly all cauline, long-petioled, 3 to 10 in. long; leaflets 11 to 25, ovate-oblong or lanceolate, 5 to 15 lines long; flowers in a thyrsoid or corymbose cluster; corolla blue or purple, sub-campanulate, cleft to below the middle, 6 to 10 lines broad, about twice as long as the calyx, its tube white or yellowish, very hairy at insertion of stamens; calyx scarcely accrescent, remaining firm, becoming 4 lines long; cells of the capsule 6 to 12-seeded; style much exceeding the corolla.—Wet ground in the mts., 4000 to 10,500 ft.: San Bernardino Mts.; Sierra Nevada from Tulare Co. to Siskiyou Co.; n. to Wash., e. to the Rocky Mts. (P. coeruleum Auth.)

4. **P. cárneum** Gray. Stem erect, ascending or climbing, solitary from a rootstock, 1 to 4 ft. high, usually widely branched above; herbage subglabrous or thinly pubescent; leaves all cauline, 3 to 8 in. long; leaflets 12 to 19, ovate or oblong-lanceolate, thin, ½ to 1½ in. long; flowers in loose terminal corymbose or subumbellate few-flowered clusters; calyx greatly accrescent in fruit, becoming chartaceous and 5 to 8 lines long; corolla pink to purple, broadly funnelform, cleft a little below middle, 7 to 12 lines long, 2 to 3 times as long as the calyx; stamens included, the filaments hairy at base; style included; ovary-cells 3 or 4-ovuled; style included.—Moist shaded ground near the coast, 50 to 1500 (or 3000) ft., uncommon: San Mateo Co. to Del Norte Co., thence e. to western Siskiyou Co.; s. Ore.

5. **P. confértum** Gray var. **exímium** Jepson n. comb. Stems several, tufted on the branched root-crown, simple, erect, 2 to 9 in. high, bearing 1 or 2 reduced leaves and a dense capitate cluster of blue flowers; leaves in a dense basal tuft, glandular-viscid and musk-scented, linear in outline, 1 to 5 in. long; leaflets numerous, usually approximate or imbricate, palmately divided into 2 to 5 segments; corolla salverform, the tube about twice as long as the calyx and much longer than the limb; cells of ovary with 3 to 5 ovules; style included.—Rocky ledges, 11,000 to 13,000 ft.: Sierra Nevada from Tulare Co. to Mariposa Co. (P. eximium Greene.)

6. **P. chartàceum** Mason n. sp. Stems several, erect, from a tufted densely leafy base; herbage villous or somewhat glandular-pubescent; leaves 2 to 6 in. long; petioles with a broad sheathing chartaceous base, not rigid in age; leaflets and corollas as in no. 5; calyx turbinate, the tube twice as long as the lobes, equaling the corolla-lobes; corolla deep blue, funnelform, 5 to 7½ lines long, the tube twice as long as the lobes; stamens exserted, the filaments hairy at base; style equaling or much exceeding the corolla-lobes.—White Mts., e. Inyo Co. (White Mountain Peak, 14,230 ft., Jepson 7383, type).

2. **COLLÒMIA** Nutt.

Herbs with alternate leaves. Flowers in ours in dense clusters with foliaceous bracts. Calyx turbinate, in age obpyramidal or cup-shaped, its teeth or lobes equal, entire, erect, the sinuses in age distended into a recurved lobe. Corolla narrowly funnelform or salverform, salmon-yellow, reddish, purple, or white. Stamens unequal, unequally or equally inserted on the tube of the corolla, mostly straight. Cells 1 to 3-seeded; seed-coat often developing spiral threads when wet. Capsule oval to obovoid. (Greek kolla, glue, on account of the mucilaginous seeds.)

Annuals; seeds becoming mucilaginous when wetted.
Leaves variously lobed, toothed or pinnately parted; capsule-valves campanulately recurved from apex on dehiscence.....1. *C. heterophylla.*

Leaves entire; capsule-valves curved backward from each side on dehiscence.
Stamens equally inserted in the corolla-throat but of unequal length.....
2. *C. tinctoria.*
Stamens unequally inserted on the corolla-tube.
Corolla 4 to 9 lines long, twice as long as calyx.....3. *C. linearis.*
Corolla 1 in. long, 3 to 4 times as long as calyx.....4. *C. grandiflora.*
Perennials; seeds not becoming mucilaginous when wetted.
Plants tall, erect; corolla yellow, 1 to 1¼ in. long.....5. *C. rawsoniana.*
Plants low, ascending from deep underground stems; corolla blue, 7 to 8 lines long..
6. *C. larsenii.*

1. **C. héterophýlla** Hook. Stem diffusely branching from the base, 3 to 11 (or 20) in. high; herbage more or less glandular or viscid-pubescent; leaves pinnately cleft or pinnately divided, the segments laciniately cleft, varying greatly in shape and size (1 to 7 lines long), the petioles ½ to as long as the blade; upper leaves, or sometimes all, ovate or oblong, incised, few-toothed or even entire, 5 to 11 lines long; flowers in small bracted clusters at the ends of the branches; calyx ½ as long as corolla; corolla red-purple, tubular-funnelform, 4 to 6 lines long, the lobes ½ to 1 line long; capsule ellipsoid, seeds 2 or 3 in each cell.—Shady places in the foothills, 500 to 2000 ft.: San Bernardino foothills; Coast Ranges from Santa Cruz Co. to Siskiyou Co.; Sierra Nevada from Tulare Co. to Shasta Co.; n. to B. C. Mar.-Apr.

2. **C. tinctòria** Kell. Stem diffusely branched, or sometimes simple, 3 to 6 in. high; herbage glandular-villous; leaves linear or lanceolate, entire, ½ to 1¾ in. long; flowers in capitate clusters at the ends of the branches or solitary or in 2s or 3s in the leaf axils; calyx in age campanulate; corolla yellow, slender-funnelform, the tube almost filiform, 4½ to 5 lines long, 1½ to 2 times as long as the calyx; stamens equally, rarely slightly unequally, inserted on the corolla, unequal in length, the longer exserted; style equaling the corolla-tube; cells of the capsule one-seeded.—Montane, 1000 to 6500 ft.: Sierra Nevada from Nevada Co. to Plumas and Lassen Cos.; North Coast Ranges from Lake Co. to Siskiyou Co.; n. to eastern Ore. June-July. (Gilia aristella Gray.)

3. **C. lineàris** Nutt. Stem simple and erect, branched from the base and diffuse, 4 to 11 (or 15) in. high; herbage puberulent, often glandular; leaves linear to linear-lanceolate, entire, ½ to 2 in. long; flowers in a terminal capitate cluster, or some in lateral 1 to few-flowered clusters; corolla red-purple or pink, slender-funnelform, minutely puberulent, 4 to 5 or 9 lines long, 1½ to 2 times as long as the calyx; stamens unequally inserted, included in the corolla-tube; style included; cells of the capsule 1-seeded.—Dry flats and slopes in the mts., 1000 to 8500 ft.: San Bernardino Mts.; Sierra Nevada from Tulare Co. to Modoc Co.; then w. to Humboldt Co.; n. to B. C. and Man., e. to Col.

766. Collomia grandiflora Dougl.; *a*, fl. stem x ½; *b*, fl. x 1; *c*, fr. calyx x 2; *d*, capsule x 2.

4. **C. grandiflòra** Dougl. Fig. 766. Stem erect, simple (or rarely branched), ⅔ to 3 ft. high; leaves linear or oblong-lanceolate, entire, sessile, 1 to 3 in. long; flowers crowded in head-like clusters at the ends of the stems and leafy-bracted, or some often borne below, either singly in the axils or in small clusters on short branchlets; calyx-tube obconical; corolla pale salmon-color, narrowly funnelform, 10 to 12 lines

long, its tube thrice as long as the calyx, its lobes broadly oblong.—Openly wooded or open slopes, 1000 to 8000 ft.: Palomar Mt.; San Jacinto Mts.; San Bernardino Mts.; Coast Ranges; Sierra Nevada; n. to B. C. and Ida.; e. to Nev. July.

5. **C. rawsoniàna** Greene. Stem simple or with a few short branches above, very leafy, 1 to 2 ft. high, arising from a slender horizontal rootstock; leaves all cauline, ovate to oblong-lanceolate, coarsely and incisely serrate or entire towards the base, rather thin, viscid-pubescent, 1½ to 4 in. long, tapering below to a petiole 2 to 10 lines long; flowers in terminal clusters; calyx 4 to 4½ lines long, its lobes narrowly lanceolate, longer than the tube; corolla orange, turning pinkish on drying, narrowly funnelform, 1 to 1¼ in. long, 4 times as long as the calyx; filaments exserted and evidently declined, inserted equally on the corolla; seeds not becoming mucilaginous, one in each cell.—Montane, 3000 to 5000 ft., Northfork, Madera Co.; extremely local.

6. **C. larsènii** (Gray) Payson. Stem simple or branched from base, 1 to 6 in. high, arising from a slender rootstock; leaves all cauline, crowded above, orbicular or ovate, entire or deeply parted, thickish, viscid-puberulent, 10 to 15 lines long, petioled; flowers in a loose terminal cluster; corolla blue or violet, narrowly funnelform, 7 to 8 lines long, about 2 times as long as the calyx; stamens unequal, equally inserted on the corolla, the longer equaling the corolla; style equaling corolla; cells of the ovary one-ovuled.—Loose rocks: Lassen Peak (rare in Cal.); n. to Wash. (Gilia larsenii Gray.)

3. PHLÓX L.

Low herbs, or sometimes slightly woody at base. Leaves opposite, entire. Flowers in cymes, blue to lavender, pink, red or white. Calyx narrow, scarious between the lobes. Corolla strictly salverform, the lobes entire or bifid, the tube slender, the throat constricted. Stamens very short, unequally inserted, included. Ovules 1 or few in each cell of the ovary. Capsule finally rupturing the persistent calyx. Seed-coats not changed when wetted. (Greek phlox, flame, the ancient name for Lychnis, transferred by Linnaeus to these plants.)

KEY TO THE SPECIES BY H. L. MASON

Perennial; corolla-limb 4 to 10 lines broad.
  Leaves narrowly linear to linear-lanceolate; corolla-tube glabrous outside.
    Style longer than calyx, equaling corolla-tube.
      Corolla-tube 3 to 4 times longer than calyx.....1. *P. superba.*
      Corolla-tube 1 to 2 times as long as calyx.....2. *P. dolichantha.*
    Style equaling or shorter than calyx, about ½ as long as corolla-tube.
      Flowers sessile or nearly so; style about equaling calyx.....3. *P. douglasii.*
      Flowers pediceled; style much shorter than calyx.
        Style longer than stigma; petals entire; pedicels shorter than calyx...
          4. *P. hirsuta.*
        Style shorter than stigma; petals notched; pedicels equaling or longer
          than calyx.....5. *P. speciosa.*
  Leaves ovate or elliptic; corolla-tube minutely glandular-puberulent..6. *P. adsurgens.*
Annual; corolla-limb 1 to 1¼ lines broad.....7. *P. gracilis.*

1. **P. supérba** Brand. Stems erect or ascending, 5 to 10 in. high; herbage thinly puberulent or glabrate, the inflorescence glandular-pubescent; leaves linear-lanceolate to lanceolate, ½ to 1½ in. long; flowers solitary in the uppermost axils, the pedicels as long as the calyx; calyx ⅓ to ¼ as long as the corolla, the lobes equaling or shorter than the calyx-tube; corolla whitish or rose-purple, glabrous, 1½ to 2¼ in. long, 3 to 4 times longer than the calyx, its lobes obovate; stamens unequally inserted, the upper pair somewhat exserted; style equaling the corolla-tube or slightly exceeding it.—Montane, 4000 to 6000 ft.: San Bernardino Mts.; ne. to southern Nev. (P. bernardina M. & J.)

2. **P. dolichántha** Gray. Stems several, erect from a woody base, 3 to 10 in. high; herbage canescent; leaves linear or linear-lanceolate, thick, ½ to 1¼ in. long; flowers in a terminal corymbose cyme; calyx 4 to 4½ lines long, the lobes broadly subulate, ⅖ as long as tube, the sinuses broadly replicate; corolla pink-red, its tube 7 lines long with a hairy ring at base inside, its lobes broadly obovate, emarginate or retuse, about half as long

as the tube; stamens unequal, the upper slightly exserted; style longer than calyx, nearly as long as corolla-tube; ovary-cells 1-ovuled.—Desert mesas, 4000 ft.: e. Mohave Desert (New York Mts.); Lassen and Modoc Cos.; n. to Wash., e. to Utah and N. Mex. (P. stansburyi Hel.)

3. **P. douglásii** Hook. Root-crown divided into several or many prostrate branches, the ultimate branchlets ascending or erect, forming a low or tufted mat 3 to 10 in. broad; herbage subglabrous or scantily puberulent; leaves linear, 3 to 5 lines long with similar leaves fascicled in the axils; flowers solitary in the upper axils, sessile or subsessile; calyx 4 to 5 lines long, the acerose teeth equaling or shorter than the puberulent tube; corolla white, whitish-lavender or lilac, 7 to 11 lines long, its lobes obovate, ½ length of tube; stamens unequal, included, the filaments shorter than the anthers; style shorter than calyx.—Rocky ledges or granite-sand slopes, montane, 4700 to 10,300 ft.: Mt. Pinos; Sierra Nevada from Fresno Co. to Modoc Co.; n. to Wash., e. to Nev. Var. CAESPITÒSA Mason n. comb. Plants very closely and densely caespitose, the branchlets not over ¼ to 1 in. high; leaves closely imbricate, the edges revolute.—Alpine summits, 10,000 to 12,500 ft.: White Mts.; Parker Pass; Mono Pass; Mt. Dana; n. to Wash., e. to Rocky Mts. (P. caespitosa Nutt.) Var. ÁUSTROMONTÀNA Jepson & Mason n. comb. Leaves long (8 to 12 lines), the edges usually not recurved; calyx plicate in the sinuses.—Mts. of S. Cal.: San Gabriel, San Bernardino, San Jacinto and Cuyamaca mountains. (P. austromontana Cov.). Var. CANÉSCENS Mason n. comb. Herbage densely white-floccose.—Modoc Co.; e. to Rocky Mts. (P. canescens T. & G.)

4. **P. hirsùta** E. Nels. Stems many, erect, from the branched root-crowns, 1½ to 2 in. high; herbage glandular-pilose; leaves ovate to oblong, acute, 3 to 6 lines long; calyx-lobes subulate, somewhat spreading, about as long as the tube, about equaling the corolla-tube; corolla white or pinkish, its tube 6 lines long, its lobes about half as long; stamens unequally inserted, included; style shorter than calyx.—Dry hills, 4000 ft., rare: Siskiyou Co.

5. **P. speciòsa** Pursh. Stems several, erect or ascending from a branched woody root-crown, 4 to 20 in. high; herbage puberulent or the leaves sometimes glabrous on one or both sides; leaves linear or lanceolate to ovate, ½ to 1½ in. long; flowers in a terminal umbellate cyme; calyx puberulent, ½ to ⅘ as long as corolla-tube, its lobes short-subulate, ½ as long as its own tube; corolla red to lavender, its tube 6 to 7 lines long, the lobes obcordate, ½ to ¾ as long; stamens unequal and unequally inserted, included; style shorter than calyx.—Hill slopes, 1500 to 5000 ft.: Sierra Nevada from Fresno Co. to Tuolumne Co.; ne. Mendocino Co. to Siskiyou Co.; Modoc Co.; n. to Wash. and Ida. (P. occidentalis Dur.)

767. Phlox gracilis Greene; *a*, habit x ½; *b*, flower x 2; *c*, long. sect. of corolla x 2; *d*, capsule x 2.

6. **P. adsúrgens** Torr. Stems diffuse or ascending, simple or sparingly branched, 4 to 10 in. long; arising from slender creeping rootstocks; herbage glabrous, the inflorescence glandular-puberulent; leaves elliptic to ovate, 6 to 14 lines long; flowers in terminal few-flowered cymes; pedicels mostly longer than calyx; calyx glandular-pubescent, its lobes subulate, spreading or recurved, longer than the tube; corolla pink-

ish-white, minutely glandular, 1 in. long, its lobes entire, about half as long as the tube; stamens very unequal, the 2 upper ones often exserted; style equaling or longer than the corolla-tube; ovary-cells 1-ovuled.—Montane, 4000 to 6000 ft.: Mendocino Co. to w. Siskiyou Co.; n. to Ore.

7. **P. grácilis** (Hook.) Greene. Fig. 767. Stem simple or branched, 3 to 8 in. high; herbage pilose-pubescent, the hairs often gland-tipped; leaves oblong to linear or lanceolate, ½ to 1¼ in. long, sessile or the lowest shortly petioled; flowers in terminal cymes; calyx cylindrical, much distended in fruit by the globose capsule, the short teeth accrescent; corolla salverform, purple or white, 3½ to 5 lines long, little surpassing the calyx, the tube often yellow; corolla-limb 1 to 1½ lines broad, its lobes roundish, emarginate; stamens unequally inserted; seeds 1 in each cell, with a rather broad thin margin.—Open hills, 300 to 8600 ft., almost throughout Cal. Mar.-Apr. (Gilia gracilis Hook. Collomia gracilis Dougl.)

4. NAVARRÈTIA R. & P.

Small annuals with mostly rigid stems. Leaves alternate, pinnate or pinnatifid or the lowest sometimes entire or subentire, the segments mostly rigid, subulate, cuspidate or spinose. Calyx not accrescent, its teeth or lobes mostly unequal, toothed or cleft, or entire, its tube scarious between the 5 angles or ribs. Corolla tubular-funnelform or salverform, blue, white or yellow. Capsule 3-celled and 3-valved, or in some species 1-celled and 4-valved. (Fr. Ferd. Navarrete, a Spanish physician.)

A. Heads with the bracts and calyces densely white-woolly.....1. *N. abramsii.*

B. Heads with the bracts and calyx-teeth pubescent to glabrous, commonly very spinescent.

1. Capsule not regularly dehiscent, the walls thin and transparent and closely covering the seeds which are agglutinated into a mass; flowers white (sometimes pale blue in no. 2).

Stems erect or spreading.
Leaves bipinnatifid; bracts densely white-tomentose.....2. *N. intertexta.*
Leaves once pinnatifid; sinuses of the calyx white-hairy.....3. *N. leucocephala.*
Primary flower-cluster seated on the ground, the branches radiating from beneath it and prostrate; calyx-segments trifid.....4. *N. prostrata.*

2. Capsule regularly dehiscent by valves and releasing the seeds which are free from each other.

Leaves (or some of them) pinnately parted with the divisions incised or parted.
Stamens exserted; capsule 1-celled.
Leaves with soft lobes; capsule 2-seeded.
Corolla creamy-white; flowers 4-merous.....5. *N. cotulaefolia.*
Corolla yellow; flowers 5-merous.....6. *N. nigellaeformis.*
Leaves with firm, rigid or pungent lobes.
Terminal leaflet spatulate- or lanceolate-dilated.
Calyx-lobes or some of them toothed; corolla blue; common.....7. *N. pubescens.*
Calyx-lobes commonly all entire; corolla blue or purple.
Capsule rounded at apex; s. of San Francisco Bay.
Calyx-lobes merely cuspidate, sub-glabrous; capsule dehiscent from the apex.....8. *N. setilobu.*
Calyx-lobes subulate, pungent, crisp-villous; capsule dehiscent from the base.....9. *N. jaredii.*
Capsule obscurely 4-lobed at apex; diffusely branched; n. of San Francisco Bay.....10. *N. mitracarpa.*
Terminal leaflet acicular-acerose; corolla yellow; low plant with much-congested heads; Sierra Nevada.....11. *N. breweri.*
Stamens not exserted; corolla blue or white.
Seeds 8 to 12 in each cell; herbage strongly mephitic-scented...12. *N. squarrosa.*
Seeds 4 in each cell; herbage honey-scented.....13. *N. mellita.*
Leaves merely pinnatifid or incised or pinnate, or some of them entire.
Small plants, 2 to 3 (or 8) in. high; stems slender; leaves filiform, entire or with 1 or 2 (or 3) pairs of short filiform lobes mostly near the base; bracts dilated, palmately cleft into 3 to 5 unequal subulate entire lobes.
Plants erect, the heads mostly on slender branches prolifierous from beneath the terminal head of the main stem.....14. *N. prolifera.*
Plants diffusely branched, mostly broader than high; branches filiform, mostly prolifierous.
Stamens exserted from corolla.....15. *N. filicaulis.*
Stamens included in corolla.
Calyx-lobes white-villous; middle altitudes, Sierra Nevada.....16. *N. divaricata.*
Calyx-sinuses densely short-hairy, otherwise subglabrous; Lassen and Modoc Cos.....17. *N. minima.*

Small or large plants, 2 to 15 in. high; leaves, or some of them, commonly with the rachis relatively broad (½ to 1 or 3 lines wide); bracts laciniately cleft or coarsely toothed.
Capsule several-seeded.
Stems slender; erect plants; bracts mostly ovate, laciniate towards the base. 18. *N. heterodoxa.*
Stems stoutish; mostly spreading plants, very coarse and spiny; bracts spiny-pinnatifid. 19. *N. atractyloides.*
Capsule with 1-seeded cells; corolla 6 to 7 lines long; bracts, especially the inner, dilated, palmately cleft into lanceolate often toothed segments. 20. *N. viscidula.*

1. **N. abrámsii** Elmer. Stem freely branching from and above the base, 2 to 5½ in. high; herbage lanate, soon glabrate, the heads persistently white-woolly; leaves ¾ to 1½ in. long, pinnately divided with 1 or 2 pairs of filiform segments, or entire and filiform; bracts with linear-filiform or subulate divisions; flowers in heads, the heads terminal on the branches, about 5 to 7 lines broad; calyx with lanceolate-subulate lobes ½ as long as the very scarious tube; corolla tubular-funnelform, pale blue, 2½ lines long, its lobes narrow, about ½ as long as the tube; capsule 3-seeded, the seeds mucilaginous under water. —Very rare: Santa Cruz Mts. (Black Mt.); perhaps also Lake Co.

768. Navarretia intertexta Hook.; *a*, fl. branch x 1; *b*, bract x 2½; *c*, fl. x 2½.

2. **N. intertéxta** (Benth.) Hook. Fig. 768. Stem erect, simple or often branching from the base, 2 to 7 in. high; herbage white-puberulent but not glandular; leaves 4 to 12 lines long, bipinnatifid, the narrowly linear or subulate segments spine-scent-tipped; bracts pinnatifid, strongly dilated at base, body of bracts and exterior of calyx-tube densely white-villous or woolly-tomentose; calyx-lobes with a tuft of hairs on the base inside, otherwise glabrous; calyx ⅔ as long as corolla; corolla white or lavender, slender-funnelform, 4½ lines long.—Depressions in the valleys and hills, 50 to 4000 ft.: Great Valley; Coast Ranges; Sierra Nevada foothills; e. side Sierra Nevada; s. to San Diego Co.; n. to Wash. and Mont. May-June. (Gilia intertexta Steud.)

3. **N. leucocéphala** Benth. Fig. 769. Stems simple or branching from the base, 3 to 5 in. high; herbage whitish-puberulent; leaves ⅓ to 2 in. long, pinnately parted, the divisions filiform, mostly remote, entire or sparingly toothed, the rachis broad and often prolonged into an elongated terminal entire division; calyx glabrous but with a tuft of hairs at each sinus, the teeth mostly entire and nearly equal, equaling the corolla; corolla clear white, 2 to 4 lines long.—Low places in fields and beds of pools where water has stood in winter or early spring, often forming dense colonies, 100 to 1500 ft.: Sierra Nevada foothills; Great Valley; Sonoma and Lake Cos. to Mendocino Co.; n. to southern Ore.

4. **N. prostràta** (Gray) Greene. Plants prostrate; primary flower-cluster or head sessile at the ground, the branches radiating from beneath it, simple or once forked, terminating in the head-like clusters, 1 to 2½ in. long; herbage glabrous; bracts and calyces white-puberulent; leaves pinnatifid, ¾ to 2 in. long, the rachis broad and elongated, the segments remote; heads dense, surrounded by foliaceous bracts 1 to 1¾ in. long; inner bracts trifid at apex, chartaceous below, not exceeding the corolla; calyx with unequal

teeth, the 2 longer tri-dentate; corolla white, 3½ lines long; calyx-teeth in fruit contracted over the 2-celled capsule; seeds 9 to 11, small.—Plains and valleys, 50 to 1500 ft.: Sacramento and San Joaquin valleys s. to coastal S. Cal. May. (Gilia prostrata Gray.)

5. **N. cótulaefòlia** (Benth.) H. & A. Stem erect, corymbosely branching from above base, 4 to 13 in. high; herbage finely pubescent; leaves ½ to 2 in. long, bipinnatifid, the segments linear, soft, barely cuspidate; bracts and calyx white-hairy, glabrous at the base; flowers commonly 4-merous; calyx-lobes varying from nearly equal and entire to unequal, with the longer variously toothed; corolla creamy or dull white, 3 to 5 lines long, somewhat exceeding the calyx; capsule 1-celled, 4-valved, dehiscing from the base, 2-seeded; embryo with entire cotyledons.—Valley fields, 20 to 1500 ft.: Coast Ranges from San Benito Co. to Mendocino Co.; Sacramento Valley and foothills w.; n. Sierra Nevada foothills; n. to Siskiyou Co. and Ore. (Gilia cotulaefolia Steud.)

769. Navarretia leucocephala Benth.; *a*, habit x ½; *b*, fl. x 2½; *c*, bract x 2½.

6. **N. nigéllaefórmis** Greene. Very close to no. 5 but flowering later when growing with it; bracts multifid; calyx-teeth pinnatifid; corolla yellow, 8 lines long.—Low places in valleys: Sacramento and San Joaquin valleys; Coast Ranges.

7. **N. pubéscens** (Benth.) H. & A. Stem erect, usually branching above, 8 to 18 in. high; herbage puberulent; leaves pinnately divided with the divisions laciniately lobed, ¾ to 1½ in. long; terminal portion of the leaf less deeply divided or merely laciniate-toothed, so that the rachis appears as if spatulate-dilated; lower portion of bracts and middle portion of calyces white-hairy, sometimes merely puberulent; 3 calyx-teeth small and entire, 2 longer and toothed, or all pinnately toothed; corolla deep blue, 7 to 8 lines long, 1¼ times as long as the calyx, the throat funnelform; stamens exserted; capsule 1-celled, 4-valved as in G. cotulaefolia; cotyledons of the embryo parted into 3 lobes, the divisions so deep as to give the appearance of 6 cotyledons.—Low hills and valleys, 10 to 1500 ft.: Coast Ranges; Great Valley; Sierra Nevada foothills. Var. TAGETÌNA Jepson n. comb. Bracts finely bipinnatifid, these and the calyces merely pubescent.—Great Valley and foothills of neighboring ranges. (N. tagetina Greene.)

8. **N. setíloba** Cov. Stem erect, branching from near the base or subsimple, 4 to 6 in. high; herbage minutely puberulent; leaves with ovate-lanceolate terminal lobe, the rachis bearing small bipinnatifid pinnae with acicular segments; terminal lobe 4 to 8 lines long, its margin irregularly and finely laciniate; bracts with lanceolate terminal lobe and subregular acerose-toothed margin, the rachis bearing on and above the dilated base 2-forked acerose segments; calyx mostly equaling the corolla; corolla blue, 4 to 5 lines long; capsule 1-seeded.—Walker Basin to Tehachapi Mts.

9. **N. jarédii** Eastw. Stem with many branches from or near the base, slender, 2 to 10 in. high; herbage puberulent; lower leaves simply pinnate, 1½ to 1 in. long, the segments acerose, cuspidate, ½ to 1½ lines long, regular, that is remotely pectinate; bracts pinnatifid; calyx about ⅔ as long as corolla, the larger lobes toothed; corolla 5 lines long, the tube filiform, the throat ample and limb 2 to 2¼ lines broad; capsule 1-celled, 1-seeded.—Dry hills, 800 to 1500 ft.: Monterey and San Luis Obispo Cos.

10. **N. mitracárpa** Greene. Stem branching at or above the base, 4 to 6 in. high, the branches ascending, slender; herbage minutely puberulent; leaves pinnate, 4 to 7 lines long, the divisions filiform, cuspidate, ½ to 2 lines long; upper leaves and bracts bipinnatifid into subulate segments; 2 calyx-teeth entire, the 3 longer toothed; corolla purple, 3 to 4 lines long, equaled by the longer calyx-teeth; stamens exserted; capsule 1-celled, 1-seeded, acutish at base, 4-valvate from base, the rounded summit obscurely 4-angled.—Dry hills, 1500 to 2500 ft.: Lake and Colusa Cos.

11. **N. brèweri** (Gray) Greene. Stem shortly branched, the branches ending in capitate clusters, thus forming a usually dense or congested plant 1 to 3½ in. high and commonly as broad; leaves pinnate with the lobes tripartite into acicular-subulate divisions, 4 to 6 or 9 lines long, the bracts with similar divisions; calyx-teeth acicular-subulate, twice as long as the tube, exceeding the corolla; corolla yellow; stamens exserted; ovary-cells 1 or 2-ovuled.—Montane valleys or flats, 4000 to 8000 ft.; easterly summits or easterly slopes of the Sierra Nevada from Amador Co. to Nevada Co.; n. to Modoc Co.

12. **N. squarròsa** (Esch.) H. & A. SKUNKWEED. Stem erect, branching at or above the base, 8 to 16 in. high; herbage pubescent and noxiously glandular; leaves ½ to 1½ in. long, once or twice pinnatifid, the segments lanceolate and often crowded; calyx 6 lines long, very scarious below, the teeth lanceolate and pungent; corolla blue, sometimes very pale, 5 to 6 lines long, its tube little or scarcely at all exceeding the teeth; stamens included; seeds many, small.—Valley levels and low hills, 50 to 2300 ft., common: Monterey Co. to Alameda, Napa, Lake and Humboldt Cos.; n. to B. C.

13. **N. mellita** Greene. Stem slender, diffusely branching from the base or sometimes subsimple and erect, often reddish, 3 to 6 (or 13) in. high; herbage glandular-villous; leaves ⅛ to 1¼ in. long, pinnately parted into linear-subulate entire or toothed segments; bracts dilated and laciniately toothed or cleft into narrow divisions, or the middle division ovate, abruptly cuspidate and often entire; heads small, 4 to 6 (or 10) lines broad; calyx equaling the corolla; corolla very slender-funnelform, very pale blue or white, 3 to 6 lines long; stamens not exserted.—Hill slopes, 200 to 1500 ft.: w. Lake Co.; Mendocino, Napa and w. Solano Cos. to Santa Clara Co. July.

14. **N. prolífera** Greene. Main stem erect, simple, 1 to 3 in. high, bearing a single terminal head, with 2 to several branches proliferous from beneath the primary head, these branches slender or filiform, naked, 1 to 3 in. long, each bearing a single head; herbage glabrous, the bracts white-tomentulose; leaves 5 to 11 lines long, filiform and entire, or with 1, 2, or 3 remote pairs of short filiform lobes ½ to 1 line long; bracts palmately 5-cleft, the undivided portion white-chartaceous; calyx about ⅔ as long as corolla, its teeth subulate, nearly twice as long as chartaceous tube, somewhat tomentulose; corolla purple or yellow, 2 to 5 lines long.—Chaparral slopes, 2000 to 4000 ft.: Sierra Nevada from Eldorado Co. to Tulare Co.

15. **N. filicáulis** (Torr.) Greene. Stems 1 to several from the base, very slender or wiry, 2 to 8 in. high; herbage minutely glandular-puberulent; leaves filiform, entire, ½ to 1¼ in. long, or pinnate with 1 or 2 pairs of short-filiform lobes near the base or at the middle; flowers in small heads, the heads 1½ to 2½ lines broad, on peduncles 3 to 10 lines long; bracts with subulate-spinose tips exceeding the flowers; calyx 1½ lines long, the teeth very unequal, 2 very small; corolla dark purple, 2½ lines long; stamens and style exserted, 1½ times as long as corolla; capsule thin-walled, 1-celled (or imperfectly 2-celled), 4 to 8-seeded.—Dry hills, 500 to 2000 ft.: Sierra Nevada foothills from Butte Co. to Mariposa Co.

16. **N. divaricàta** (Torr.) Greene. Main stem short, ¼ to ½ in. high, terminated by a head of flowers and bearing 2 to several ascending or spreading very slender branches, each terminated by a head usually with 2 to 4 branches proliferous from beneath each secondary head, these latter branches ending in a head or cluster of heads, the plants 1¼ to 3¼ in. high, usually broader than high; body of heads 3 to 5 lines broad; herbage villous or glabrate; bracts white-pubescent at base, palmately cleft into 3 to 5 acerose divisions equaling or exceeding the flowers; leaves filiform

or acicular, 4 to 9 lines long, simple or with 2 pairs of short-acicular teeth near the base; calyx 2 to 2½ lines long, exceeding or at least equaling the corolla, rarely a little shorter, its lobes very unequal, acerose, entire, cobwebby; corolla minute, pinkish or purplish; capsule cells 3 to 6-seeded.—Sandy flats and borders of meadows or dry openly forested slopes and ridges, abundant, often forming dense colonies: Sierra Nevada, 3500 to 8200 ft., from Kern Co. to Nevada Co. and n. to Siskiyou and Modoc Cos.; White Mts.; Coast Ranges, 2500 to 5000 ft., from Lake Co. to Mendocino Co.; n. to southern Ore.

17. **N. mínima** Nutt. Stem branched from the base, 1 to 2½ in. high; herbage scantily puberulent or subglabrous; leaves pinnate, 3 to 5 lines long, the segments linear or subulate; bracts similar to the leaves; calyx-lobes 1½ times as long as the tube, the scarious intervals between the ribs very broad, the sinuses densely short-hairy; corolla white, 2½ to 3 lines long, shorter than the calyx.—Overflowed places or margins of ponds, 4000 to 6000 ft.: Lassen Co. to Modoc Co.; n. to Ore., e. to Col. July-Aug.

18. **N. héterodóxa** (Gray) Greene. Stem very slender, erect, branching, rarely simple, 4 to 11 in. high; herbage slightly glandular-puberulent; internodes long; leaves ½ to 1¼ in. long, the lower ones with narrowly linear rachis and many pinnate short-subulate segments, the uppermost lanceolate and entire except at the laciniately toothed base; bracts lanceolate to broadly ovate, laciniate-toothed towards the base; calyx-segments entire, nearly equal; corolla blue, 5 lines long, with exserted declined stamens; capsule 8 to 14-seeded, the seeds small.—Dry hills, 500 to 1500 ft.: Napa and Sonoma Cos. to Santa Clara Co. June. (N. parvula Greene. N. rosulata Brand.)

19. **N. atráctyloides** (Benth.) H. & A. Stems freely branched, stoutish, the branches short and spreading or procumbent, 2 to 8 in. high; herbage somewhat purplish and villous-pubescent; leaves rigidly coriaceous, oblong-lanceolate to ovate, ½ to 1½ in. long, the rachis or main body (1 or) 2 to 4 lines broad, the margin armed with subulate or aristate teeth; bracts similar to the leaves, very coriaceous and spiny; calyx-segments moderately or very unequal, ovate to lanceolate, entire, setaceous at apex; corolla narrowly funnelform, purple, 7 to 9 lines long; stamens included; seeds about 10 in each cell.—Dry hills, 500 to 1500 ft.: Humboldt Co., w. Colusa Co. and Lake Co. to coastal S. Cal. July. Habit suggesting certain species of Chorizanthe. (N. macrantha Brand.) Var. FOLIÀCEA Jepson n. comb. Leaves with broad (2 to 3½ lines) rachis, less coriaceous, the lobes or teeth less spinose; corolla white. — Monterey Co. to San Diego Co. (N. foliacea Greene.) Var. FLÁVIDA Jepson n. var. Similar to var. foliacea; corolla yellow with purple markings. —San Gabriel Mts. (North Fork San Gabriel River, 1500 ft., F. W. Peirson, type). Var. HAMÀTA Jepson n. comb. Stems sometimes slender; rachis of leaves ¼ to 3 lines broad; 3 terminal spines of leaves and bracts conspicuously divaricate or hooked. — Open ground or open woods, near the coast, Monterey Co. to San Diego Co. (N. hamata Greene.)

20. **N. viscídula** Benth. Fig. 770. Stem erect, subdivaricately or somewhat proliferously branched, sometimes spreading or subprostrate,

770. Navarretia viscidula Benth.; *a*, habit x 1; *b*, bract x 2; *c*, long. sect. of fl. x 2.

sometimes dwarfish and simple, 1¼ to 7 in. high; herbage viscid-pubescent; leaves ¼ to 2½ in. long, narrow, the lower with slender rachis and remote filiform lobes, the upper with broad rachis and remote short-subulate lobes; bracts little dilated, palmately parted, the lobes incisely toothed, or ovate with 1 or 2 laciniate teeth on each side; corolla rather large, blue-purple, 5 to 7 lines long, 1½ times as long as the calyx, the limb 2 lines broad, its lobes elliptic; stamens exserted; ovules 1 to 4 in each cell.—Valleys, plains and low hills, sandy soil, rocky slopes, or sun-baked clays, 100 to 1500 ft.: Coast Ranges (back from the coast) from Contra Costa Co. to Mendocino Co.; Great Valley; Sierra Nevada foothills from Butte Co. to Tulare Co. (Gilia viscidula H. & A.) Var. PURPÙREA Jepson n. comb. Bracts rather densely villous at base.—Amador and Calaveras Cos. (N. purpurea Greene.)

5. **HUGÈLIA** Benth.

Herbs lanate when young, not at all glandular. Leaves or their simple divisions linear or filiform and rigid. Flowers crowded into capitate leafy-bracted clusters. Bracts 3 to 5-cleft, these and the calyces densely woolly-matted. Calyx-lobes subulate, pungent. Corolla salverform. Stamens exserted; anthers deeply sagittate. Capsule many-seeded. Seed-coats changing under water. (Baron Charles de Hugel of Vienna.) WELWITSCHIA.

Woody-based perennial; corolla-tube 2 to 3 times longer than the calyx. . . . 1. *H. densifolia.*
Annual or biennial; corolla-tube scarcely or but little longer than the calyx.
  Corolla regular.
    Corolla-lobes ¼ to ⅓ as long as tube, the limb blue . . . . . 2. *H. filifolia.*
    Corolla-lobes scarcely or but little longer than the tube.
      Corolla yellow . . . . . 3. *H. lutea.*
      Corolla blue.
        Leaves 1 to 3-parted . . . . . 4. *H. virgata*
        Leaves 3 to 7-parted . . . . . 5. *H. brauntonii*
  Corolla-lobes arranged in 2 lips, the limb lavender . . . . . 6. *H. eremica.*

1. **H. densifòlia** Benth. Stems many from a tufted woody base, erect, simple or branched above, 5 to 14 in. (or 2 ft.) high; herbage lanate-tomentose when young, glabrate in age; leaves ¼ to 2¼ in. long, narrowly linear and entire or with 1 to 3 pairs of short-subulate spinulose lobes at the middle or toward the base; flower-clusters terminal, dense, the foliaceous bracts and the calyces implexed-woolly; corolla deep blue, 5 to 8 lines long, its tube little longer than the longest calyx-lobe, its own lobes oblong, about 2 lines long.—Dry or chaparral slopes, 1000 to 6000 ft.: San Diego Co. to the San Bernardino and San Gabriel mountains and n. to Santa Clara Co.: Tehachapi Mts.; s. Sierra Nevada in Kern Co.; Owens Valley. June-Sept. (Gilia densifolia Benth.) Var. SANCTÒRUM Jepson n. comb. Corolla 1 to 1¼ in. long. San Bernardino Valley. (Gilia densifolia var. sanctorum Milliken.)

2. **H. filifòlia** Jepson n. comb. Stem erect, simple or virgately branched, 2 to 8 in. high; herbage white-tomentulose or glabrate; leaves filiform, entire or at base with 2 small lobes, 4 to 11 lines long; heads densely woolly; bracts 2 to 5-cleft, mostly recurved, at base hyaline; calyx densely woolly, its lobes shorter than the tube; corolla blue, 5 to 6 lines long, its tube mostly equaled by the calyx; stamens barely exserted, ovary-cells 4-ovuled.—Plains and valleys, 1500 to 4000 ft.: San Diego Co.; Lassen Co.; n. to Wash., e. to N. Mex., s. to L. Cal. (Gilia filifolia Nutt.) Var. SPARSIFLÒRA Jepson n. comb. Heads 1 to 3-flowered; corolla white, the throat purple-dotted.—S. Sierra Nevada in Fresno Co. (Gilia sparsiflora Eastw.)

3. **H. lùtea** Benth. Stem erect, nearly simple or branched from the base, 2 to 7 in. high; herbage arachnoid-tomentose or glabrate, the heads woolly; leaves linear, entire or with 1 or 2 short lobes at base, ½ to 1¼ in. long; corolla bright yellow, salverform, 4½ to 5 lines long, its lobes narrow-ovate, nearly as long as the tube; ovary-cells 1 or 2-ovuled.—Mountain slopes, 500 to 1500 ft.: Monterey Co. to n. San Luis Obispo Co. (Gilia lutescens Steud.)

4. **H. virgàta** Benth. Stems simple or branching from the base, 5 to 15 in. high; leaves filiform, entire, the upper 3-parted, ½ to 1 in. long; flowers in small head-like clusters, the clusters terminal on the stem or branches or virgately disposed along the branches, or the branchlets much elongated and the inflorescence thus corymbose; bracts and calyx very densely woolly; corolla tubular-funnelform, blue (the throat yellow), 6 to 8 lines long, surpassing the

acerose calyx-lobes; stamens exserted; anthers 1 line long.—Hillslopes, 1000 to 2000 ft.: coastal S. Cal.; n. to Monterey Co. June-July. (Gilia virgata Steud.) Var. SAPPHÍRINA Jepson n. comb. Openly branched, ¾ to 2 ft. high; leaves entire; clusters few (2 to 4)-flowered, weakly lanate.—San Jacinto Mts. to Cuyamaca Mts. (Gilia sapphirina Eastw.) Var. FLOCCÒSA Jepson n. comb. Stem freely branched, 5 to 11 in. high, the heads small, densely and persistently woolly; leaves linear-filiform, entire; corolla lavender; anthers ½ line long.—East slope or e. summits of the Sierra Nevada from Lassen Co. to Fresno Co. (Gilia floccosa Gray.) Var. PYGMAÈA Jepson n. var. Plants 4 to 7 lines high, the flower-clusters 1 to 3, capitately congested, almost sessile on the ground; leaves linear, entire.—New York Mts., e. Mohave Desert (Jepson 5463, type). Var. DASYÁNTHA Jepson n. comb. Closely and repeatedly branched, 2 to 5 in. high; leaves narrow, entire or with 1 or 2 pair of teeth or short lobes near the base; heads 6 to 8-flowered, densely woolly.—Colorado Desert. (Navarretia virgata var. dasyantha Brand.)

5. **H. brauntònii** Jepson & Mason n. comb. Stem mostly simple below and branched above, erect, 5 to 9 in. high; leaves pinnately parted into 3 to 7 filiform divisions, ¾ to 1¼ in. long, shortly petioled or subsessile; heads dense, floccose, ½ to mostly 1 in. broad; corolla tubular-funnelform, vivid blue, 6 to 9 lines long; stamens exserted beyond the tube.—Sandy flats in the mts. or valleys, 1000 to 6000 ft.: South Coast Ranges; San Joaquin Valley; s. Sierra Nevada foothills from Fresno Co. to Tulare Co. June-Aug. (Gilia brauntonii Jepson & Mason. G. virgata var. floribunda Gray.)

6. **H. erèmica** Jepson n. sp. Stems many from the base, freely and often dichotomously branched, 4 to 6 in. high; leaves 5 to 9 lines long, pinnately divided into 5 to 7 short linear lobes; heads small, densely woolly; corolla violet or lavender, twice as long as the calyx, its lobes bilabiately arranged, with 3 lobes in upper lip, and 2 lobes spreading right and left as a lower lip.—Central Mohave Desert (Calico Wash, ne. of Barstow, Jepson 5414, type).

6. GÍLIA R. & P.

Annual or sometimes perennial herbs. Leaves all, or rarely only the upper, alternate, pinnately toothed, lobed, or divided, or sometimes entire. Calyx-teeth usually equal, the tube scarious below the sinuses, ruptured by the growing capsule. Corolla funnel- to salver-form, blue, yellow, red or white, the lobes mostly shorter than the tube, the stamens equally (rarely unequally) inserted on its throat. Capsule 3-celled and 3-valved, the seeds many, rarely few or one. (Felipe Luis Gil, Spanish botanist of the latter half of the 18th century.)

A. PLANTS PERENNIAL OR BIENNIAL.

Flowers red (pink or yellowish) ..... 1. *G. aggregata.*
Flowers white ..... 2. *G. congesta.*

B. PLANTS ANNUAL.

1. Flowers in dense heads or in loose clusters.

Inflorescence not leafy.
  Flowers 25 to 50 in dense heads ..... 3. *G. capitata.*
  Flowers in loose clusters or open cymes, 3 to 10 in each cluster.
    Corolla tricolored ..... 4. *G. tricolor.*
    Corolla blue (to white) ..... 5. *G. multicaulis.*
Inflorescence leafy-bracted.
  Flowers loosely congested; bracts mostly twice as long as flower-cluster; stems moderately leafy ..... 6. *G. depressa.*
  Flowers in closely compact heads; bracts mostly little exceeding heads; stems sparsely leafy ..... 7. *G. polycladon.*

2. Flowers in open panicles or cymes.

Corolla funnelform or tubular.
  Upper cauline leaves pinnatifid.
    Leaves predominantly cauline.
      Leaf divisions filiform or linear ..... 8. *G. peduncularis.*
      Leaf divisions lanceolate.
        Calyx entirely herbaceous ..... 9. *G. traskiae.*
        Calyx membranous below the sinuses to the base ..... 10. *G. gilioides.*
    Leaves predominantly basal; flowers yellow ..... 11. *G. ochroleuca.*

Upper cauline leaves variously lobed or entire.
Plants with the stems arising from a basal rosette of leaves.
Flowers ½ to 1 in. long....12. *G. tenuiflora.*
Flowers less than ½ in. long.
Corolla-lobes entire at apex....13. *G. latiflora.*
Corolla-lobes notched at apex....14. *G. leptomeria.*
Plants with the leaves principally cauline.
Leaves linear or lanceolate.
Leaves elliptic-lanceolate (often a few serrations); corolla mostly tubular....10. *G. gilioides.*
Leaves subfiliform to linear, entire; corolla funnelform.
Corolla purple to magenta....15. *G. leptalea.*
Corolla white....16. *G. capillaris.*
Leaves broad, coarsely toothed....17. *G. latifolia.*
Corolla campanulate.
Corolla 2½ to 5 lines long.
Leaves linear, entire; stamens inserted at sinuses of corolla....18. *G. filiformis.*
Leaves oblong-ovate, dentate or entire; stamens inserted at base of corolla-tube..
19. *G. campanulata.*
Corolla 1½ to 2 lines long....20. *G. micromeria.*

1. **G. aggregàta** (Pursh) Spreng. SCARLET GILIA. SKYROCKET. Fig. 771. Stem 1 or several from the perennial or biennial root-crown, erect and usually simple, 1 to 2½ ft. high; herbage puberulent and often slightly glandular, the leaf midribs often white-villous; leaves pinnate or bipinnate with linear segments, ½ to 1½ in. long, the petioles ½ to 1¼ times as long, the segments rather remote or those of the basal leaves crowded, 3 to 8 lines long; flowers in an elongate thyrse; calyx 1½ to 3 lines long, its lanceolate lobes 2 times as long as the tube; corolla salverform, commonly scarlet but varying through salmon and pink to white, ¾ to 1¼ in. long, the subcylindric tube 2 to 5 times as long as the calyx, the lobes ovate-lanceolate, 4 to 5½ lines long, rotate, becoming reflexed; stamens unequal, inserted in the sinuses, about equaling or much exceeded by the corolla-lobes, frequently declined; capsule ovoid, the cells many-seeded; seeds flat, showing spirioles when wetted.—Moist sandy flats or loose soil on sunny slopes, opens or openly wooded ridges, 4000 to 10,000 ft.: Sierra Nevada from Tulare and Inyo Cos. to Modoc Co.; Coast Ranges from Lake Co. to Siskiyou Co.; n. to Can., e. to the Great Plains. June-Aug.

771. Gilia aggregata Spreng.; *a*, lower part of plant; *b*, infl. x ½.

Var. BRIDGESII Gray. Low, 3 to 6 in. high; leaf-segments crowded, more obtuse.—Sierra Nevada and s. to Providence Mts.

2. **G. congésta** Hook. Stems few to many, slender, tufted, simple or branched, erect or ascending, 5 to 10 in. high; herbage sparingly villous or somewhat floccose-canescent; leaves equal in size and distribution up the stem, commonly pinnate with 4 to 7 lobes but frequently trifid, the margins more or less revolute, the lobes linear, cuspidate, 2 lines long, often crowded at the end of the petiole; flowers in dense bracteate capitate clusters, the clusters 5 to 7 lines broad, corymbosely arranged; calyx about equaling the corolla-tube, its lobes linear, cuspidate, villous-pubescent, about ⅓ as long as the tube; corolla short-salverform, white, 2½ to 3 lines long, its tube 1½ lines long and the limb about as wide; stamens inserted in the sinuses, evidently but not conspicuously exserted; capsule oval, about 1 line long, 1 to 3-seeded; seed-coats changing when wetted.—Dry ridges and plateau plains,

772. Gilia capitata Dougl. var. achilleaefolia Mason; *a*, inflorescence x 1; *b*, fl. x 3.

5000 to 11,000 ft.: White Mts.; Tuolumne Co. to e. Shasta, Lassen and Modoc Cos.; n. to Wash., e. to Utah. June-Aug.

3. **G. capitàta** Dougl. Stem simple or commonly strictly branched above, ⅔ to 3 ft. high, the leaves basal and cauline, gradually reduced upwards; herbage glabrous to puberulent, sometimes minutely glandular; leaves 1 to 4 in. long, pinnate to bipinnate with linear lobes, petioled, the petioles 2 to 12 lines long; flowers in terminal heads on naked peduncles, the peduncles long (2 to 13 in.); heads 5 to 11 lines broad; calyx glabrous, rarely pubescent or woolly; corolla funnelform, white to blue, purple and lavender, 3 to 4 lines long, its lobes linear; stamens inserted in the sinuses, exserted; capsule ovate, several-seeded; seeds showing spirioles when wetted. —Open slopes and flats, 500 to 5000 ft.: Sierra Nevada; North Coast Ranges; n. to Wash. (G. glandulifera Hel.) The varieties merge with the species, the geographic segregation here indicated being only approximate. Var. ACHÍLLEAEFÒLIA Mason n. comb. Fig. 772. Heads commonly 8 to 18 lines broad; calyx commonly woolly or pubescent, sometimes glabrous; corolla 4 to 6 lines long.— Hillslopes and valleys, 50 to 5300 ft.: Sonoma and Contra Costa Cos. to San Diego Co.; San Joaquin Valley; Tehachapi Mts. (G. achilleaefolia Benth. G. abrotanifolia Nutt. G. chamissonis Greene.) Var. REGÍNA Jepson n. var. Stem erect, 2 to 6 in. high, forked once, the leaves in a sub-basal tuft; heads 1 to 1¾ in. broad; corolla deep blue. — Sand dunes, Pt. Reyes peninsula (Jepson 8315, type).

4. **G. tricolor** Benth. Fig. 773. Stem slender, erect, with few branches from or above the base, or with many branches from the base and ascending, 8 to 16 in. high, the leaves in a basal tuft and also cauline; herbage glabrate to somewhat glandular; leaves pinnate, 1 to 1¾ (or 3½) in. long, the petioles ¼ to ½ as long, the segments linear, mostly remote, entire or pinnately toothed or laciniately cleft, 1 to 1½ lines long; flowers in terminal cymes, the cymes on slender peduncles; calyx cylindric to turbinate, somewhat glandular, 2 lines long, the slender teeth ½ as long as the tube; corolla funnelform, 6 to 8½ lines long, tricolored, lobes light blue, tube and base of throat yellow, top of throat dark blue; stamens equal, equally inserted just below the sinuses; anthers oval; style exceeding the

773. Gilia tricolor Benth.; *a*, infl.; *b*, lower leaf. x 1.

stamens; capsule many-seeded.—Open foothills, 100 to 3000 ft.: Coast Ranges from San Emigdio Mts. and from Monterey Co. to Mendocino Co.; Sierra Nevada foothills from Kern Co. to Butte Co.

5. **G. multicáulis** Benth. Stem simple to much branched, strict or ascending, 6 to 20 in. high; herbage glabrate or puberulent or occasionally glandular; leaves chiefly basal or sub-basal, slightly reduced up the stem, pinnate or bipinnate with remote very narrow lobes, the lower ones 1½ to 4 in. long, petioled, upper ones sessile; flowers in terminal 2 to 7-flowered glomerules, without bracts; calyx cleft ⅓, its lobes triangular-lanceolate; corolla funnelform, blue or pinkish, 3½ to 5 (usually about 4) lines long, about twice as long as calyx; tube yellowish; stamens shorter than the corolla-lobes, inserted in the corolla-throat; capsule ovate-oblong, the cells many-seeded; seeds showing spiricles when wetted.—Open places, hillsides and valleys, 500 to 3000 ft.: Vaca Mts. and Marin Co. to S. Cal. Feb.-June. A common and variable species. Var. MÍLLEFOLIÀTA Jepson n. comb. Corolla little surpassing calyx, its throat ornamented with 5 black spots.—Along the coast, Humboldt Co. to Monterey Co. (G. millefoliata F. & M.) Var. NEVÍNII Jepson n. comb. Stem erect with usually strict short branches, 9 to 14 in. high; herbage pubescent, slightly glandular; leaves numerous, cauline, thrice pinnate with short narrow segments, ½ to 1½ in. long, the lower on petioles ¼ to as long, the upper reduced and becoming sessile; glomerules bracteate; corolla very narrowly funnelform, bluish, 3½ to 4 lines long, ¼ longer than calyx; capsule oblong.—Insular: Santa Barbara Isls.; Guadaloupe Isl. (G. nevinii Gray.)

6. **G. depréssa** Jones. Stem branched from or above the base, 2 to 3½ in. high; herbage grayish-pubescent, especially above; leaves thickish, linear-lanceolate or lanceolate-ovate, entire or with a pair of small spreading cuspidulate-tipped lobes, thickish, 6 to 10 lines long, short-petioled; bracts ovate to ovate-lanceolate; flowers in very leafy terminal glomerules; calyx cleft ½; corolla tubular-funnelform, 3 lines long, white, 1 to 1½ times as long as calyx; stamens included; capsule globose-ovate, its cells several-seeded; seeds showing spiricles when wetted.—Desert flats or cañons, rare: Rabbit Sprs., Mohave Desert; Argus Mts.; Deep Spring Valley, Inyo Co.; e. to Nev. and Utah.

7. **G. polýcladon** Torr. Branches from the base about 2 to 7, erect or strictly ascending, 4 to 8 in. high, the leaves remote along the branches and in a basal rosette (which disappears early); herbage puberulent, the stems sometimes a little glandular; leaves pinnatifid with cuspidulate segments, ½ to ¾ in. long, on petioles about ½ as long; flowers in close very leafy clusters ½ to ¾ in. broad; bracts narrowly ovate to obovate; corolla tubular, white, 1 to 2 lines long, little or scarcely at all exceeding the calyx; stamens on short filaments in the corolla-throat, included; capsule oval, the cells 2 (occasionally 1)-seeded; seeds showing spiricles when wetted.—Inyo Co. (Deep Spring Valley); e. to Utah and western Tex.

8. **G. pedunculàris** Eastw. Stem much-branched from the base, 8 to 16 in. high, the branches slender, the leaves few and remote; herbage glabrate or somewhat glandular-villous above; leaves simple or bipinnate with remote narrow lobes, 1 to 2 in. long, petioled or the upper sessile; flowers in cymes, the cymes 1 to 4-flowered, the peduncles slender, 1½ to 2 in. long, somewhat divaricate; calyx 1½ lines long, rather more than half as long as the corolla; corolla tubular-funnelform, blue, 2½ to 4 lines long; stamens included, inserted at the sinuses; capsule ovate, the cells several-seeded; seeds mucilaginous when wetted.—Grassy slopes, Coast Ranges from Santa Clara Co. to s. Monterey Co.; s. to San Diego Co. and L. Cal. May.

9. **G. tráskiae** Eastw. Stem slender, branching, erect or decumbent, 5 to 6 in. high; herbage glandular-pubescent; leaves variously pinnately toothed to divided or entire, ¾ to 1¼ in. long, the lower on petioles ⅓ or ½ as long; flowers solitary on the upper portions of the stem, the pedicels slender; calyx entirely herbaceous, the lobes cut nearly to the base; corolla tubular-funnelform, white, 3 lines long, 1½ times calyx; stamens equal, equally inserted near base of corolla-tube; capsule many-seeded.—Santa Catalina Isl.

10. **G. gilioìdes** (Benth.) Greene. Fig. 774. Stem erect, 4 to 12 in. high, or becoming much branched, with the branches diffusely spreading or prostrate, ½ to 2½ ft. long, leafy; herbage more or less villous and glutinous; leaves simple, linear, oblanceolate or narrowly obovate, ½ to 1½ in. long, the lower narrowed to a short petiole, or pinnate or pinnately cleft with 5 lobes or leaflets, these similar in shape to the simple leaves, or the upper leaves commonly trifid and sessile, the leaflets or lobes entire, commonly very unequal; flowers solitary or at times geminate and glomerate on slender peduncles, arranged in open irregular leafy cymes; calyx-lobes erect, linear, half as long as the tube; corolla tubular to somewhat funnelform, blue (rarely white or crimson), 3 to 5 lines long, 2 to 3 times as long as the calyx; stamens unequal, inserted unequally high in the tube, not conspicuously exserted; style exserted; capsule globose, its cells 1 (rarely 2)-seeded; seeds becoming mucilaginous when wetted.—Dryish flats or slopes, hills and mountains, 2500 to 9000 ft.; common throughout Cal. Mar.-Aug. Var. GREENEÀNA Brand. Leaves with very broad segments, 2 to 5 lines wide, at times entire.—Same range, but in moister places. Var. GLUTINÒSA Jepson n. comb. Stamens exserted.—Coastal S. Cal. (Collomia glutinosa Benth.)

774. Gilia gilioides Greene.; *a*, habit x ½; *b*, *c*, *d*, leaf types x ½; *e*, fl. x 3.

11. **G. ochroleùca** Jones. Stems slender, several from the base, branched, erect or ascending, 4 to 7 in. high, the leaves in a basal tuft but also cauline and reduced upwards; herbage glabrous, the stems often somewhat glaucous, the leaves rarely a little villous beneath, the inflorescence usually glandular; lower leaves pinnate, 8 to 10 lines long, shortly petioled, the lobes linear, entire or pinnatifid; cauline leaves pinnate or pinnatifid, sessile; flowers on slender pedicels in loose open cymes; calyx about 1 line long, its teeth ⅓ to ¼ as long as the tube; corolla tubular-funnelform, yellow, rarely purplish-tinged, 2 to 2½ (or 3½) lines long, its tube ¾ to 1 line long, commonly about equaling the calyx, or distinctly shorter or 1½ times as long, the throat usually a trifle shorter than the tube; stamens included; capsule ovate, cells several-seeded; seeds showing spiricles when wetted.—Desert slopes and mesas, 2000 to 4000 ft.: Mohave Desert; s. Sierra Nevada in Kern Co.; Inyo Co. Feb.-June.

12. **G. ténuiflòra** Benth. Stems 1 to many, erect or ascending from a basal cluster of leaves, ⅓ to 2½ ft. high; herbage glabrous to tomentulose, or often floccose below, often glandular, especially above; leaves pinnately parted or divided, or some merely toothed, ½ to 2 in. long, on petioles ¼ to ½ as long; primary segments pinnatifid or bipinnatifid or some entire, 1 to 4 lines long; cauline leaves greatly reduced, becoming short linear-lanceolate bracts toward the inflorescence; inflorescence paniculate to glomerate, the flowers usually on short (½ to 6 lines long) pedicels; calyx cylindric to globose, glandular-pubescent, membranous to base below the sinuses, 1¼ to 1½ lines long, the teeth lanceolate, ⅓ to ½ as long as the tube; corolla slenderly tubular-funnelform, pink, red or blue, 7 to 14 lines long; stamens unequal, equally inserted below the sinuses, included or slightly exserted; capsule many-seeded, equaling or exceeding the calyx; seed-coats developing mucilage when wetted.—Valleys and open hillslopes, 1500 to 6000

ft.: coastal S. Cal.; Colorado Desert; Mohave Desert; n. to Monterey, Tulare and Inyo Cos. (G. arenaria Brand. G. grinnellii Brand.) Var. PURPÛSII Milliken. Basal leaves floccose to arachnoid-pubescent, the segments incisely pinnatifid, broad-based.—Desert mts.: Inyo Co. Var. CÀNA Jepson n. comb. Basal leaves white-tomentose, the segments orbicular or ovate, crenate or subentire, often with narrow base.—Mountain slopes, 6000 to 9000 ft.: Inyo Co. (G. latiflora var. cana Jones.) Var. DÀVYI Mason n. comb. Leaves pinnately toothed, glabrous and somewhat fleshy.—San Gabriel Mts.; Mohave Desert; s. Sierra Nevada in Tulare Co. (G. davyi Milliken.)

13. **G. latiflòra** Gray. Stems few to many, erect or ascending from a basal cluster of leaves, ⅛ to 2½ ft. high; herbage glabrous to tomentulose, or often floccose below, often glandular; leaves pinnately parted or divided, or some merely toothed, ½ to 2 in. long, on petioles ¼ to ½ as long; primary segments pinnatifid or some entire, 1 to 4 lines long; cauline leaves greatly reduced, becoming short bracts toward the inflorescence; inflorescence paniculate, the flowers on short pedicels; calyx cylindric to globose, glandular-pubescent, membranous to base below the sinuses, 1½ to 2 lines long, the teeth lanceolate, ⅛ to ½ as long as tube; corolla funnelform, blue to lavender, pink or whitish, 4 to 5 lines long; stamens unequal, equally inserted below the sinuses, somewhat exserted; capsule many-seeded, equaling or exceeding the calyx; seeds developing mucilage when wetted.—Valleys, plains and open hillslopes, 1500 to 5500 ft.: coastal S. Cal.; Colorado and Mohave deserts; Inyo Co.; Modoc Co. Var. CÁRUIFÒLIA Jepson n. comb. Stem erect, 1¼ to 2 ft. high, branching above and forming a very large panicle; corolla purple, its throat yellow.—Ventura Co. to Cuyamaca and Laguna mountains. (G. caruifolia Abrams.)

14. **G. leptomèria** Gray. Stems few to many from the base, more or less glandular, 3 to 9 in. high; leaves in a basal rosette, linear or oblanceolate in outline, pinnately lobed or toothed, ¼ to 2 in. long, shortly petioled; cauline leaves represented by small oblong or linear bracts subtending the branches of the open-paniculate cymes; calyx about ⅓ as long as corolla; corolla salverform, white, pinkish or purplish, 2 to 3 lines long, its lobes short, acute or with 1 to 3 cuspidate teeth; stamens inserted in throat, very short; capsule oval or oblong, the cells several-seeded; seeds unchanged when wetted.—Desert valleys, 2000 to 5000 ft.: e. Mohave Desert; Inyo Co.; n. to Ore., e. to Utah and Ariz. Apr.-June.

775. Gilia leptalea Greene: *a*, habit x ½; *b*, fl. x 2; *c*, long. sect. of fl. x 2.

15. **G. leptàlea** (Gray) Greene. Fig. 775. Stem freely (sometimes diffusely) and dichotomously branched or sometimes simple, erect, 2 to 12 in. (or to 1¾ ft.) high, the leaves scanty, all cauline, the lowest pairs of leaves opposite but these early disappearing; herbage glabrate to puberulent, minutely glandular; leaves mostly subfiliform (or very narrowly linear or very narrowly lanceolate), 6 to 15 lines long, mostly ¼ to ⅓ (or 1) line wide; inflorescence diffusely cymose, the flowers on filiform pedicels 2 to 10 lines long; calyx 1¼ to 2 lines long, its lobes about half as long as the tube; corolla funnelform, rose to purple or magenta, 4½ to 9 lines long, the tube very narrow, dilated into a very large throat; throat light or whitish with blue markings, the tube yellowish; stamens inserted in throat,

more or less unequal, included or exserted; capsule oblong, its cells 2 to 4-seeded; seeds showing spircles when wetted.—Open slopes and flats in the mts., 1000 to 9000 ft., common: Sierra Nevada from Tulare Co. to Plumas Co.; North Coast Ranges from Lake Co. to Mendocino Co. June-Aug.

16. **G. capillàris** Kell. Stem erect, commonly branching above, 2 to 9 in. high; leaves linear to narrow-lanceolate, 4 to 12 lines long, mostly ½ to 1 line wide; corolla tubular-funnelform, white, 2 to 3 lines long, the tube much less conspicuously dilated than in G. leptalea.—Northerly or half-shaded slopes, 6000 to 8100 ft., n. Sierra Nevada from Mariposa Co. to Siskiyou Co., infrequent.

17. **G. latifòlia** Wats. Coarse plants 3 to 13 in. high, the primary axis short and stout (1 to 2 in. long) with several ascending branches, or sometimes the stem simple and erect; herbage glandular-villous; leaves borne mostly on the lower ⅓ or ½ of the plant, or subrosulate, 1 to 4½ in. long, ovate-oblong or nearly orbicular, coarsely serrate or irregularly incised, the teeth or lobes cuspidate; lower leaves petioled, the petioles 5 to 11 lines long, the upper leaves subsessile; flowers more or less congested into umbellate clusters borne in a dichotomous cyme; pedicels none to 12 lines long; calyx glandular-hairy, cleft halfway, about as long as corolla-tube, its lobes subulate; corolla short-salverform, pinkish, 3½ to 4 lines long, the tube slightly exceeding the calyx, the lobes ovate, broader at the middle than at base, very acute; stamens unequal, inserted on the tube; capsule oblong, the cells many-seeded; seeds not showing spircles when wetted.—Desert plains and washes of cañons, 100 to 4000 ft., abundant: Colorado and Mohave deserts; Inyo Co. Apr.-May. It has the odor of Datura meteloides.

18. **G. filifórmis** Parry. Stem branching from near the base, erect or diffuse, 4 to 7 in. high; herbage glabrous, sometimes with a faint bloom, sometimes minutely glandular above; leaves all cauline, filiform, ½ to 1 in. long; inflorescence paniculately cymose, the flowers on filiform pedicels 2½ to 12 lines long; calyx about ½ as long as corolla, its lobes lanceolate, twice as long as the tube; corolla campanulate, yellow, 2½ to 3 lines long, parted to near the base into oblong lobes; stamens unequal, inserted at the sinuses; capsule ovate, the cells several-seeded; seeds mucilaginous when wetted.—Desert mesas and cañons, 2000 to 4000 ft.: e. Mohave Desert; Inyo Co.; e. to Utah. May.

19. **G. campanulàta** Gray. Stem branched from or above the base with ascending somewhat glandular slender branches, 1¼ to 3 in. high; leaves oblong or linear-oblong, entire or with a few narrow divergent teeth, cauline and basal 3 to 8 lines long; inflorescence cymose, the flowers solitary on slender pedicels 1 to 6 lines long or grouped in small glomerules; calyx parted nearly to base, the lobes broadly lanceolate with white scarious margins; corolla campanulate, white with a yellowish throat, 3 to 4 lines long, twice as long as the calyx, its lobes much shorter than throat and tube; stamens included, unequal, inserted at base of corolla-tube; capsule ovate, the cells several-seeded.—Arid slopes, 5000 to 6500 ft.: e. Inyo Co.; e. to southern Nev. Var BREVIÚSCULA Jepson n. var. Corolla 2 lines long, the lobes equaling throat and tube.—Flats or cañons, 5200 to 6200 ft.: s. Sierra Nevada in Tulare Co. (Lloyd Mdws., Kern River, Jepson 4902, type); w. Inyo Co.

20. **G. micromèria** Gray. Stems several from the base, diffuse, 2 to 6 in. high; herbage glabrous or with minute gland-tipped hairs; leaves basal and cauline, linear-lanceolate, entire or pinnatifid, 3 to 7 lines long, much reduced above; cyme paniculately branched; pedicels slender, 2 to 10 lines long; calyx wholly herbaceous with 5 blunt lobes, glabrous; corolla campanulate to very short-funnelform, white or blue, 1½ to 2 lines long; stamens equal, equally inserted; anthers oval.—E. side Sierra Nevada (presumably Modoc Co.); nw. Nev. to e. Ore.

7. LINÁNTHUS Benth.

Low or slender annuals. Leaves opposite, palmately divided to the base into narrowly linear or filiform divisions (thus almost seeming as if in whorls in some species), rarely entire, rarely with some uppermost alternate. Flowers

scattered or in terminal capitate clusters. Calyx-tube commonly scarious between the ribs or angles, its teeth equal. Corolla campanulate, funnelform, or salverform. Stamens equally inserted on the corolla. Capsule with few to many seeds in each cell. (Greek linon, flax, and anthos, flower.)

A. Corolla campanulate to funnelfokm, its proper tube very short or obscure, much shorter than the throat; deserts or mostly so.—Subgenus Parrya.

Flowers 2 to 3½ lines long; calyx-lobes a little unequal.
Disk at base of corolla 5-lobed....1. *L. maculatus.*
Disk at base of corolla entire....2. *L. demissus.*
Flowers 5 to 7½ lines long; calyx-lobes equal....3. *L. parryae.*

B. Corolla funnelform or salverform.

1. Flowers mostly scattered, usually solitary in the axils or terminal; corolla funnelform or tubular-funnelform, the throat tapering gradually down to the tube.

Calyx-tube almost wholly membranous; corolla-lobes with 2 dark lines at base.—Subgenus Millikenia....4. *L. concinnus.*
Calyx-tube membranous only below the sinuses.
Flowers 7½ to 10 lines long.
Corolla-lobes dentate; filaments hairy at base; anthers elliptic.—Subgenus Fenzlia....5. *L. dianthiflorus.*
Corolla-lobes entire; anthers linear-oblong.—Subgenus Eulinanthus.
Filaments flattened at base into a hairy pad....6. *L. dichotomus.*
Filaments glabrous at base....7. *L. bigelovii.*
Flowers 1 to 7½ lines long (see also no. 15).—Subgenus Dactylophyllum.
Stamens inserted just below sinuses; corolla golden or cream yellow.
Flowers mostly in close glomerules, short-pediceled to subsessile; pedicels ½ to 1½ lines long....8. *L. lemmonii.*
Flowers paniculately cymose, long-pediceled; pedicels 2 to 8 lines long....9. *L. aureus.*
Stamens inserted on lower half of throat.
Corolla funnelform, white or cream-color, rarely lilac.
Stems branching from the base, the branches at length dichotomous; plants diffuse....10. *L. filipes.*
Stems simple below, branching above, the branches mostly simple; plants erect.
Filaments glabrous at base, the corolla without hairy ring.
Corolla ¾ to 1 line long....11. *L. harknessii.*
Corolla 4 to 7½ lines long....12. *L. liniflorus.*
Filaments hairy at base, forming a hairy ring on the corolla at insertion....13. *L. pharnaceoides.*
Corolla tubular-funnelform.
Corolla white or pink, 2½ to 5 lines long....14. *L. bolanderi.*
Corolla blue, 6 to 10 lines long....15. *L. ambiguus.*

2. Flowers sessile in dense clusters or heads.

Corolla funnelform or tubular-funnelform, the tube as long to twice as long as throat.—Subgenus Pacificus
Corolla-tube subequal to or shorter than lobes....16. *L. grandiflorus.*
Corolla-tube longer than lobes....17. *L. oreuttii.*
Corolla strictly salverform, the tube slender-filiform, mostly 10 to 20 times as long as the throat.—Subgenus Leptosiphon.
Calyx membranous only in sinuses.
Corolla-lobes 2 to 3 lines broad.
Corolla-tube twice as long as calyx....18. *L. serrulatus.*
Corolla-tube 3 to 4 times as long as calyx....19. *L. androsaceus.*
Corolla-lobes ½ to 1½ lines broad.
Corolla-lobes 2 to 3 lines long; corolla purple, pink or pale yellow....20. *L. parviflorus.*
Corolla-lobes 1 to 1½ lines long.
Corolla golden-yellow....21. *L. acicularis.*
Corolla pinkish or purplish....22. *L. bicolor.*
Calyx membranous to base below sinuses.
Inflorescence coarsely ciliate pubescent.
Corolla-lobes 1 to 1½ lines long....23. *L. ciliatus.*
Corolla-lobes 2½ to 3½ lines long, a purple spot at base..24. *L. montanus.*
Inflorescence finely pilose.
Leaf-segments linear; corolla 7½ to 12½ lines long, its lobes obovate, obtuse....25. *L. breviculus.*
Leaf-segments oblanceolate; corolla 4 to 6 lines long, its lobes quadrate, truncate or emarginate....26. *L. oblanceolatus.*

1. **L. maculàtus** (Parish) Milliken. Stem branched from the base, ¾ to 1 in. high, sparsely hispid-villous, equally leafy; leaves oblong-linear, entire, cuspidate, thick, 1 to 2 lines long; flowers on very short pedicels in leafy glomerate cymes; calyx parted almost to base, exceeding the corolla-tube, nearly equaling the corolla-lobes; calyx-lobes oblong-linear, ciliate, with a very narrow hyaline margin, evidently unequal, cuspidate; corolla campan-

ulate, white, 2 lines long, the lobes about ¼ as long as tube; stamens on long filaments, inserted low in the tube; capsule oval, the cells several-seeded; seeds unchanged when wetted.—Nw. corner of Colorado Desert: Palm Sprs.; Whitewater. Rare. Mar.-Apr.

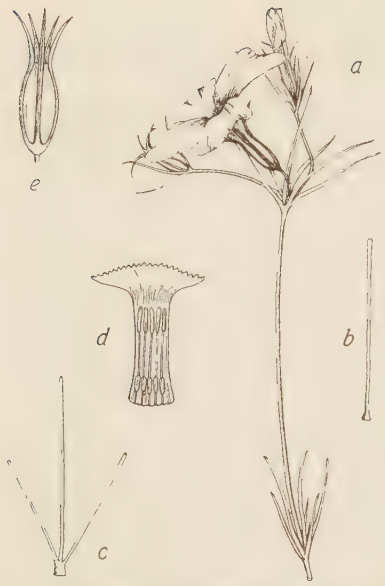
2. **L. demíssus** (Gray) Greene. Branches many from base, dichotomously rebranched, decumbent or ascending, 1 to 3 in. long, equally leafy throughout, the leaves not reduced above; herbage glabrate or thinly puberulent, sparingly and microscopically glandular; leaves trifidly divided with spreading or divergent lobes, or entire, the leaf or its lobes linear, conspicuously cuspidate, 2½ to 5 lines long; flowers in close leafy cymes, short-pediceled; calyx divided nearly to base into lanceolate lobes with hyaline or white-scarious margins, exceeding the corolla-throat; calyx-tube below sinuses scarious; corolla campanulate, white with purple-streaked throat, 2½ to 4 lines long; corolla-lobes quadratish-oblong, ⅔ as long as throat, the proper tube very short, the long stamens inserted almost on its summit; capsule oblong-oval, ½ as long as the calyx; cells several-seeded; seeds unchanged when wetted.—Desert plains and cañons, 2000 to 7500 ft.: e. Mohave Desert; Panamint Mts.; e. to Utah and Ariz. Apr.-May. (Gilia demissa Gray. L. dactylophyllum Rydb.)

3. **L. párryae** (Gray) Greene. Stem compactly branched, 1 to 2½ in. high; herbage puberulent; leaves opposite, at least below, palmately 3 to 7-parted into acerose segments, 2 to 5 lines long; flowers several to numerous, congested in leafy cymes; calyx-lobes broadly scarious-margined, 2 to 3 times as long as the tube; corolla funnelform, yellow (with a dark throat) or bluish-lilac, or white, with dark purple reniform crests at base of the lobes. 5 to 8 lines long, 6 to 9 lines wide, the lobes nearly twice as long as tube and throat combined, the tube about ½ as long as the throat; filaments dilated at base, inserted at the summit of the corolla-tube; capsule obovate, the cells many-seeded; seeds minute, scarcely ⅛ line long, showing spicules slightly when wetted.—Sandy desert flats and hard soil of arid slopes, 2000 to 6300 ft.; Mohave Desert; n. to southern Sierra Nevada in Kern and Inyo Cos. Mar.-June.

4. **L. concínnus** Milliken. Stem loosely branched, the branches ascending, 2 to 5 in. high; herbage slightly glandular-puberulent; leaves opposite, at least below, palmately 3 to 7-parted into linear or linear-spatulate acerose or cuspidate lobes, 3 to 6 lines long; flowers in bracteate loosely glomerate cymes; calyx-lobes linear, ¼ to ⅓ as long as tube, the intervals between the ribs and base of tube conspicuously hyaline-membranous; corolla funnelform, white with a yellowish tube and throat, 5 to 7½ lines long, 4½ to 6 lines wide, the limb equaling the tube and throat; filaments inserted in the corolla-tube, somewhat dilated at the base; capsule ovoid-oblong, the cells 2 to 4-seeded; seeds about a line long, unchanged when wetted.—Dry rocky mountain slopes, 5000 to 7000 ft., infrequent: San Gabriel Mts.

5. **L. diánthiflòrus** (Benth.) Greene. Fringed Pink. Stem branching, erect or spreading, 2 to 6 in. high; herbage subglabrous or minutely puberulent; leaves opposite below but frequently alternate above, linear-filiform, entire, 2 to 7 (or 15) lines long; plants abundantly floriferous, the flowers in small few-flowered leafy cymes, the pedicels shorter than the calyx; calyx usually cleft to below the middle; corolla funnelform, lilac or pink, 6 to 9 lines long, 5½ to 10 lines wide, its lobes dentate, about equaling the combined length of tube and throat; throat yellow, marked with 5 spots, a little exceeding the yellowish or purplish tube; filaments hairy and dilated at the base, inserted in the tube, included; capsule oblong, the cells many-seeded; seeds winged.—Sandy ground, 500 to 2000 ft.: common in open fields in the coastal valleys of S. Cal. or sometimes on cañon flats: w. side Colorado Desert; s. to L. Cal. Jan.-May. (Gilia dianthoides Endl.)

6. **L. dichótomus** Benth. Evening Snow. Fig. 776. Stem simple or dichotomously branched, 3 to 12 in. high, the leaves all opposite, the flowers on short pedicels in the forks or terminal, the pedicels ¼ to 2 lines long; herbage glabrous with a glaucous tinge; leaves entire or palmately 3 to 5 or 7-divided, the leaf or its divisions narrowly linear or filiform, 6 to 12 lines long; flower



776. Linanthus dichotomus Benth.; *a*, fl. branch x ¾; *b*, entire leaf x ½; *c*, divided leaf x ½; *d*, long. sect. of corolla-tube x 1¾; *e*, calyx x 1¾.

opening in late afternoon and closing the next morning; calyx cylindraceous with conspicuous hyaline intervals, its subulate lobes spreading, ⅓ or ¼ as long as the tube; corolla tubular-funnelform, white with a brownish throat, ¾ to 1¼ in. long, about 2 times as long as calyx, the lobes a little exceeding the tube and strongly convolute in the bud; stamens inserted below the middle of the tube, included; filaments with a hairy pad at base; style very short, about equaling the ovary; capsule oblong, the cells many-seeded; seeds with a white bladdery very loosely investing alveolate testa. —Gravelly or sandy places, 1000 to 5000 ft.: Sierra Nevada from Butte Co. to Tulare Co.; Great Valley (infrequent); Sonoma and Napa Cos. s. to Los Angeles and San Diego Cos.; Mohave Desert; Inyo Co. Mar.-July.

7. **L. bigelòvii** (Gray) Greene. Stem dichotomously branched from the base, 2 to 12 in. high, the flowers subsessile in the forks or terminal on the branchlets; herbage glabrous, pallid; leaves opposite throughout, very narrowly linear and entire, or rarely 2 or 3-parted, 6 to 10 lines long; calyx cylindrical, glabrous, with very conspicuous hyaline intervals between the ribs, 4 to 5 lines long, its spreading lobes 1 to 1⅓ lines long; corolla funnelform-tubular, yellow or orange with a dark circle in the throat, 4 to 6 lines long, exceeded by or exceeding the calyx; corolla-tube well developed and twice as long as the lobes, these usually strongly convolute in bud and 1 to 2 lines long; stamens inserted at about the middle of the tube, included; filaments glabrous at base; style 3-cleft more than half way; capsule oblong, the cells many-seeded; seeds with a closely enveloping slightly bladdery testa.—Desert slopes and valleys, 2000 to 5300 ft., infrequent: Colorado and Mohave deserts; Mt. Pinos; San Carlos Range; e. to Utah and western Tex. Apr.-June. Var. JÒNESII Jepson and Mason n. comb. Calyx covered with stout stipitate glands; hilum of seeds often in a deep pit.—Deserts, 500 to 2000 ft.: Inyo Co.; Mohave and Colorado deserts; s. to L. Cal.; uncommon. Mar.-May. (Gilia jonesii Gray.)

8. **L. lemmònii** (Gray) Greene. Stem diffusely branched, spreading, 2 to 6 in. high; herbage puberulent or somewhat canescent; leaves divided into 3 to 5 linear lobes, 1 to 2 lines long, somewhat ciliate; flowers in close terminal glomerules, or a few long-pedicelled; calyx-lobes about as long as the tube, slightly ciliate; corolla funnelform, dull or pale cream-white or yellowish with dark throat, 2½ to 3 lines long, the tube about 1 line long and equaling the broad throat, the lobes 1 to 1½ lines long; stamens inserted in the throat; capsule oblong, the cells many-seeded.—Sandy ground, 1000 to 5500 ft., back of the coast: San Bernardino Valley and San Jacinto Mts. to San Diego Co.; w. side Colorado Desert; s. to L. Cal. Apr.-June.

9. **L. áureus** (Nutt.) Greene. Stem diffusely and usually widely branched, 1½ to 7 in. high; herbage glabrate to puberulent, occasionally a little glandular; leaves palmately divided into 3 to 7 linear lobes, 1½ to 3 lines long; flowers on capillary pedicels in small paniculate cymes; calyx exceeding the corolla-tube, its lobes ⅓ to ⅗ as long as the calyx-tube; corolla lemon-yellow with a brownish throat, funnelform, 3 to 7 lines long, the tube whitish, 1 to 1½ lines long, the throat slightly exceeding tube; stamens inserted in the sinuses; capsule ovoid, the cells many-seeded; seeds small,

showing spirícles when wetted.—Sandy ground, 1000 to 4000 (or 6000) ft., often very abundant locally: coastal S. Cal.; Colorado and Mohave deserts and their bordering ranges; Inyo Co. Apr.-June. Var. DÉCORUS (Gray) Jepson. Corolla white or pale violet.—Colorado Desert.

10. **L. fílipes** (Benth.) Greene. Fig. 777. Stem commonly much branched dichotomously, erect or very diffuse, filiform, 2 to 5 in. high; herbage puberulent; leaves palmately 5-parted, 1½ to 4 lines long; inflorescence dichotomously paniculate-cymose; pedicels filiform, 2 to 5 lines long; calyx hispidulose, ⅖ as long as the corolla, the lobes equal, somewhat pungent-tipped; corolla short-funnelform, white to cream-color, rarely lilac, 2½ to 4 lines long, with a hairy ring at the insertion of stamens; stamens inserted near the base of the throat; style exceeding the stamens.—Open or openly wooded slopes or flats in the foothills, 200 to 4000 ft., abundant: Sierra Nevada from Tulare Co. to Siskiyou Co., thence s. to Humboldt and w. Solano Cos.; also on the rolling plains bordering the foothills. (Gilia filipes Benth. G. pusilla Gray.)

777. Linanthus filipes Greene; *a*, habit x ½; *b*, fl. x 2; *c*, long. sect. of corolla x 2; *d*, calyx x 2.

11. **L. harknéssii** (Curran) Greene. Stem strictly erect, very slender, branching mostly above the base and ending above in a dichotomously branched paniculate cyme, 3 to 10 in. high; herbage sparsely puberulent, becoming glabrous; leaves palmately 3 to 5-parted into linear segments 1½ to 8 lines long; flowers minute, solitary on filiform pedicels, the pedicels 3 to 10 lines long; calyx glabrous or nearly so, little shorter than the corolla, its lobes equal, about ½ as long as the calyx-tube; corolla funnelform, white, ¾ to 1½ lines long, glabrous; stamens inserted at the base of the throat, filaments glabrous.—Open places, usually in granite soil, 5000 to 7000 ft.: Plumas, Modoc, Shasta and Siskiyou Cos.; Yollo Bolly Mts.; n. to Ida., e. to Wyo. June.

12. **L. liniflòrus** (Benth.) Greene. Stem erect, usually simple below but freely and widely branched above, ¾ to 1½ ft. high, glabrous; leaves palmately 3 to 7-divided into linear-filiform segments, microscopically scabrous, pubescent in the sinuses, 3 to 5 (or 10) lines long; flowers on long capillary pedicels in a dichotomously branched paniculate cyme, the pedicels mostly 4 to 14 lines long; calyx 2 to 2½ lines long, its lobes oblong or lanceolate, ¼ to ½ as long as the tube; corolla short-funnelform, white or tinged with pink or lilac, 5 to 8 lines long, the tube very short, ½ to 1 line long, the throat about 2 lines long; stamens inserted in the corolla-sinuses, about ½ the length of the lobes; capsule oval, the cells several-seeded; seeds mucilaginous when wetted.—Open places, 100 to 4500 ft.: San Joaquin Valley; Placer Co.; Contra Costa Co. and San Francisco to San Mateo Co.; s. to coastal S. Cal. (Gilia liniflora Benth.) Var. VALLÍCOLA Jepson n. var. Pedicels widely divaricate, curved at tip, the flower thus erect.—Bakersfield plain (Jepson 8944, type.)

13. **L. pharnàceoides** (Benth.) Greene. Stem erect, simple below or loosely and oppositely branched from the base upwards, 8 to 18 in. high; herbage glabrous or puberulent; leaves palmately 3 to 7-divided into linear-filiform segments; flowers on long capillary pedicels, in a dichotomously branched cymose panicle; calyx 2 to 2½ lines long, its lobes ¼ to ½ as long as tube;

corolla short-funnelform, 3 to 4 lines long, the tube ½ to ¾ line long, the throat not much exceeding it; stamens inserted in the sinuses, not exserted, the filaments hairy at base; capsule oval, the cells several-seeded; seeds mucilaginous when wetted.—San Luis Obispo Co. to Monterey Co. Apr.-June. (Gilia pharnaceoides Benth.)

14. **L. bolánderi** (Gray) Greene. Stem very slender, di- or tri-chotomously branched from the base or sometimes simple, 2 to 6 in. high, glabrate or puberulent, occasionally a little glandular above but very minutely so; leaves palmately parted into 3 to 7 linear lobes, a little hirsutulose, 1 to 2 lines long; flowers cymose, the pedicels capillary, 3 to 6 lines long; calyx usually distinctly striate, about as long as corolla-tube; corolla tubular-funnelform, pink or white, 3 to 4 (or 6) lines long; stamens inserted in the sinuses, about 4 to 9 lines long; capsule oblong, the cells several-seeded; seeds showing spirioles when wetted.—Dry slopes, often on outcropping ledges, 500 to 2000 ft.: Coast Ranges from San Benito and San Mateo Cos. to Tehama and Siskiyou Cos., thence s. in the Sierra Nevada foothills to Mariposa Co. and Tehachapi Range; n. to Wash. (Gilia bolanderi Gray. G. rattani Gray.)

15. **L. ambíguus** (Rattan) Greene. Stem simple or branched, erect, 2½ to 6 (rarely 12) in. high, puberulent; leaves palmately 5-parted, 1 to 3 lines long, hirsutulose; flowers loosely cymose, the pedicels filiform, 5 to 10 lines long; calyx-lobes equal, puberulent; corolla tubular-funnelform, light blue, the tube very long, brown to purplish; stamens inserted at top of throat; style slightly exceeding anthers.—Open hill slopes, forming colonies, 2000 to 3000 ft.: Mt. Hamilton Range, e. slope Santa Cruz Mts. from Loma Prieta to Redwood City. The flowers close about 4 o'clock in the afternoon and open tardily the next morning. (Gilia rattani Fl. W. Mid. Cal.)

16. **L. grandiflòrus** (Benth.) Greene. Stem simple, erect, 3 to 10 or 14 in. high, pubescent when young, at length glabrous; leaves palmately parted into narrowly linear lobes 7½ to 12½ lines long, the lower puberulent to glabrous, those in the inflorescence ciliate; flowers 1 to many in a dense head in the terminal and subterminal axils; calyx scarious below the sinuses, its lobes ciliate, the tube longer than the lobes; corolla funnelform to almost salverform, white or pink, 7½ to 12½ lines long, the throat long-tapering, about equaling the tube, the tube hairy within; stamens inserted on the base of the throat, equaling the throat, the filaments glabrous; style included.—Openly wooded mountain slopes or valley flats, 20 to 2500 ft.: Marin and Alameda Cos. to Monterey Co. (L. densiflorus Jepson. Leptosiphon densiflorus Benth.)

17. **L. orcúttii** Jepson n. comb. Stem branched from the base, 3 to 5 in. high; herbage puberulent; leaves palmately parted, 1½ to 3 lines long; flowers capitately congested, sometimes axillary; calyx-lobes equal, sometimes pungent-tipped, membranous-margined below, the membrane united and forming a tube near the base; corolla funnelform to salverform, pink-white, 7½ to 10 lines long, the tube exceeding the calyx, the throat about ½ as long as the tube; stamens inserted on the base of the throat and as long; filaments glabrous, recurved from the point of insertion; style exceeding the stamens. Palomar Mt., n. San Diego Co.; s. to northern L. Cal. (Gilia orcuttii Parry & Gray. L. pacificus Milliken.)

18. **L. serrulàtus** Greene. Stem erect, simple or branched, 4 to 8 in. high, sparsely pubescent; leaves in few whorls, palmately 5 to 7-parted, lobes linear; flowers capitately and terminally congested, occasionally a few flowers in the axils of the branches; calyx mostly herbaceous, only slightly membranous in the sinuses, parted nearly to base into subulate lobes, ½ to as long as corolla-tube; corolla salverform, white to cream-color, the tube purple, 5 to 10 lines long, pilose-pubescent, the throat yellow; corolla-lobes 2½ to 4 lines long; stamens inserted on the base of the throat; style exceeding the anthers; ovary-cells 1 to many-ovuled.—Mountain valleys and cañon slopes, 2000 to 4000 ft.: s. Sierra Nevada from Mariposa Co. to Tulare Co. (L. mariposanus Milliken.)

19. **L. androsàceus** (Benth.) Greene. Fig. 778. Stem simple or branched from the base, 3 to 14 in. high, puberulent; leaves palmately divided into oblanceolate or linear lobes, 2 to 12 lines long, commonly ciliate or sometimes puberulent; flowers in dense heads; bracts few to many; calyx herbaceous, membranous only in the sinuses; corolla salverform, white, pink, lavender or yellow, the tube 6 to 13 lines long, 4 to 6 times as long as the calyx, often darker in color than the corolla-lobes; corolla-lobes broadly obovate to oblong, 2 to 3 lines broad by 3 to 5 lines long; stamens little surpassing throat of corolla.—Open hillslopes and valleys, 50 to 3500 ft.: Coast Ranges from Humboldt Co. to Solano, Santa Clara and San Luis Obispo Cos. Apr.-June. It is very variable as to size and color and not well differentiated from L. parviflorus. Var. CRÒCEUS Jepson n. comb. Corolla golden-yellow; tube 1 to 1¾ in. long, the limb 5 to 7 lines broad.—Coastal bluffs and beaches, San Mateo Co. (Linanthus croceus Eastw.)

778. Linanthus androsaceus Greene; *a*, fl. stem x 1; *b*, fl. x 1½.

20. **L. parviflòrus** (Benth.) Greene. Stem simple or with few branches from the base, erect, commonly 3 to 6 or 11 in. high, almost glabrous to puberulent; leaves palmately 3 to 7-parted, the lobes spatulate to linear, 2½ to 6 lines long; bracts scabrous or hirsutulous, not ciliate or scarcely so, commonly 3 to 4 lines long; flowers capitately congested; calyx ¼ to ⅓ as long as corolla-tube; corolla purple, pinkish, white, or pale yellow, ¾ to 1½ in. long, the lobes oval, 1½ to 2½ lines long, tinged with red or brown on the outside, the throat yellow; stamens half or commonly more than half as long as corolla-limb.—Open ground in the hill country, 200 to 2000 ft., a very abundant species: Coast Ranges from Mendocino Co. to Monterey Co.; s. to coastal S. Cal. as far as San Diego. (Gilia micrantha Steud.) Var. ROSÀCEUS Jepson. Much branched from the base; leaves often palmately parted rather than divided; corolla rose-color or white, larger than in the species.—Sandhills and bluffs along the coast: San Francisco Co. to San Mateo Co.

21. **L. áciculàris** Greene. Stem simple, somewhat rigid, very slender, 1 to 4 in. high; near to but less pubescent than L. parviflorus; leaf-segments linear-acerose; corolla golden-yellow throughout, its tube slenderly filiform, about 6 lines long, obovate lobes not exceeding 1 line.—Wooded hills, 200 to 2300 ft., not common: Tehama and Humboldt Cos. to Alameda and San Benito Cos.; Sierra Nevada from Tuolumne Co. to Kern Co.; s. to Palomar Mt. (L. parviflorus var. luteolus Milliken.)

22. **L. bicolor** (Nutt.) Greene. Very near L. parviflorus but dwarf, 1 to 4 in. high; leaves and bracts hispidulous-ciliate; corolla dull purple or pink with yellow throat, its lobes very short (1 to 1½ lines long) in proportion to the tube which is 6 to 9 lines long.—Open hills or thinly wooded hills, 300 to 2500 ft., infrequent: Coast Ranges from Humboldt Co. to Contra Costa and Santa Clara Cos. and s. to coastal S. Cal.; Sierra Nevada from Placer Co. to Tulare Co. May. (Gilia tenella Benth.)

23. **L. ciliàtus** (Benth.) Greene. Stem simple or branched, somewhat rigid, 4 to 5 (rarely to 12) in. high; herbage finely puberulent; leaves palmately parted into linear lobes, ciliate, 2 to 6 (rarely 9) lines long; flowers capitately congested; bracts ciliate; calyx membranous to base below the sinuses, ½ to as long as corolla-tube, the lobes acerose; corolla salverform,

6 to 9 lines long, deep rose-red or purple, only slightly exceeding the bracts, the throat yellow, the lobes 1 to 1½ lines long by ¾ line broad.—Openly wooded hills and mountain slopes, 300 to 8000 ft.: Siskiyou Co.; Coast Ranges; Sierra Nevada; coastal S. Cal. Var. NEGLÉCTUS Jepson n. comb. Stem very slender, simple, 1 to 2 in. high; corolla-lobes variegated.—Sierra Nevada, 6000 to 9000 ft. (L. neglectus Greene.)

24. **L. montànus** Greene. MUSTANG CLOVER. Stem commonly simple, erect, 4 to 22 in. high, coarsely pubescent near the base, puberulent above; internodes long; leaves palmately 5 to 7-parted into oblanceolate or linear lobes, 3 to 15 lines long, hispid or hispidulose; flowers capitately congested; bracts densely and coarsely bristly-ciliate; calyx membranous to base below sinuses, about ⅓ as long as corolla-tube; calyx-lobes subulate, about as long as tube; corolla long-salverform, pink-red or white, the tube 10 to 14 lines long, pubescent; throat yellow, short, lobes 2½ to 3½ lines long, often with a purple spot at the base; stamens inserted at the base of the throat, often one shorter than the rest; style slightly exceeding the stamens.—Openly wooded slopes, 1200 to 5000 ft.: Sierra Nevada from Calaveras Co. to Tulare Co. Apr.-May.

25. **L. brevículus** (Gray) Greene. Stem simple or much branched from or above the base, glabrate or minutely pilose, 4 to 12 in. high; leaves palmately 3 to 5-lobed, finely pilose, the lobes linear-oblong, 1 to 3 lines long; flowers capitately congested at the ends of the branches and in clusters in the uppermost axils; bracts few; calyx membranous to the base below the sinuses, pilose-pubescent; corolla salverform, white to purple or lavender-crimson, 7½ to 12 lines long, the tube 2½ to 3 times as long as the calyx; tube and lower portion of the throat dark blue or purple; stamens inserted near the base of the throat; style exceeding the anthers.—Open or brushy slopes or mesas, 3000 to 7000 ft.: San Gabriel Mts. and San Bernardino Mts.; desert ranges in Mohave Desert. Var. NUDÀTUS Mason n. comb.—Bracts membranous in sinuses to half their length.—Montane flats, 5000 to 6000 ft.: s. Sierra Nevada in Tulare Co. to Tehachapi Mts. (L. nudatus Greene.)

26. **L. oblánceolàtus** Eastw. Stem simple or with a few short branches, 1½ to 6 in. high; herbage scantily puberulent; cotyledons sessile, persistent; leaves palmately parted, the lobes oblanceolate to linear-oblanceolate, somewhat callous-margined, 1½ to 4 lines long; flowers congested in a terminal head or occasionally with 1 or 2 flowers in the uppermost axils; calyx membranous in the sinuses, the tube somewhat distended by the maturing capsule; corolla salverform, white, 2½ to 5 lines long, the lobes quadrate, truncate or emarginate, the tube equaling or somewhat exceeding the bracts, the throat yellow; stamens inserted in the throat, exserted, exceeding the style.—Mountain flats, 8600 to 10,000 ft.: upper basin of Kern River. (Gilia tularensis Brand.)

8. LEPTODÁCTYLON H. & A.

Perennial herbs or undershrubs, commonly tufted and very leafy. Leaves alternate or opposite, much fascicled in the axils, palmately 3 to 9-parted. Flowers showy, pink, lilac or white, borne in few-flowered terminal clusters or solitary. Corolla salverform or with funnelform throat, the tube commonly exceeding the calyx. Stamens short, inserted in or below the throat. (Greek leptus, narrow, and dactylon, finger, in reference to the palmately parted leaves.)

Leaves alternate, pungent; dwarf shrubs or woody-based herb-like plants; calyx membranous below sinuses.
  Leaves mostly persistent for 2 or more seasons; corolla tubular-funnelform, the tube 1½ to 2 times as long as the lobes; stamens inserted in throat ..... 1. *L. pungens.*
  Leaves deciduous after first season; corolla strictly salverform, the tube equaling or shorter than the lobes; stamens inserted at middle of corolla-tube ..... 2. *L. californicum.*
Leaves opposite, not pungent; plants herbaceous or woody based; calyx not membranous below sinuses ..... 3. *L. nuttallii.*

1. **L. púngens** (Torr.) Nutt. GRANITE GILIA. Fig. 779. Stems several to numerous, branching, arising from a branched woody base, crowded densely with leaves to top, 3 to 8 in. high, Phlox-like and often forming a rough mat;

stems of the season puberulent to densely villous and frequently also glandular, the older branches shedding their juvenile pallid pubescent epidermis, leaving them dark and rough; leaves persistent for 2 or 3 seasons, prevalently alternate but the lower ones occasionally opposite, palmately divided into 3 or 5 acerose lobes, 1 to 7 lines long, with shorter ones in the axils; leaf-lobes not strongly unequal; flowers sessile, terminal or solitary in the upper axils, or congested into a few-flowered cluster; calyx scarious between the ribs, its lobes unequal, ⅕ to ⅓ as long as the tube; corolla tubular-funnelform, white or pink or at times yellow, 9 to 11 lines long, the tube 1½ to 2 times as long as the calyx and about 2 times as long as the obovate corolla-lobes; stamens equal, the anthers almost sessile, inserted in the corolla-throat, included; capsule oblong, the cells many-seeded; style very short, only a little longer than the capsule; seeds unchanged under water.—Dry gravelly or rocky places, mostly on granite, 6000 to 12,000 ft.: mts. of S. Cal.; Mt. Pinos; desert ranges; Sierra Nevada from Tulare Co. to Sierra Co.; e. Ore. and Nev. to Rocky Mts. (Cantua pungens Torr. Gilia pungens Benth.) Var. HÓOKERI Jepson n. comb. Stems less crowded with leaves, or in places naked on account of the long internodes; leaves palmately 3 or 5-lobed, the lateral lobes about ½ shorter than the intermediate; corolla white, 7 to 8 lines long, its lobes oblanceolate.—Interior or more arid ranges, 6000 to 8500 ft.: mts. of S. Cal.; east slope or easterly summits of the Sierra Nevada; n. to B. C., e. to Col. (Gilia hookeri Benth. G. pungens var. hookeri Gray.) Var. TENUÍLOBUM Jepson n. comb. Leaves alternate, palmately 3-parted, the middle lobe 2 times longer than the lateral ones; bracts mostly longer than the calyx; flowers solitary and terminal; corolla light yellow.—San Gabriel, San Bernardino and San Jacinto mountains. (Gilia tenuiloba Parish.) Var. HÁLLII Jepson n. comb. Leaves mostly opposite, palmately 3-parted, the middle lobe 2 to 3 times longer than the lateral ones; corolla white or yellowish, 5 to 7 lines long.—Coyote Cañon, Santa Rosa Mts. (Gilia hallii Parish.)

779. Leptodactylon pungens Jepson; *a*, fl. branchlet x ½; *b*, long. sect. of corolla x 1; *c*, calyx x 1½.

2. **L. californicum** H. & A. PRICKLY PHLOX. Erect shrub 1 to 3 ft. high, or at least woody below, the branches thickly clothed with spiny foliage; herbage puberulent, sometimes slightly glandular, densely pubescent in the inflorescence; leaves alternate, or occasionally opposite, especially below, 1 to 3½ lines long, palmately 5 to 9-divided into rigid narrowly linear acerose lobes, deciduous; flowers sessile, solitary in the upper axils but thus congested into few-flowered clusters; calyx as long to ⅕ as long as corolla-tube, its lobes pungent, ⅓ as long as calyx-tube; corolla salverform, bright rose-color or pink, 7 to 9 lines long, 9 to 17 lines wide, its lobes equaling or slightly exceeding the tube; stamens included, inserted above the middle of the tube, the filaments very short; capsule elongated, the cells many-seeded; style rather short, included; seeds unchanged under water.—Chaparral slopes or borders of washes, 1000 to 5000 ft.: s. Monterey Co. to Orange and w. Riverside Cos. Feb.-May. (Gilia californica Benth.)

3. **L. nuttállii** (Gray) Rydb. Stems numerous from a woody root-crown, erect or ascending, simple or oppositely branched, 3 to 9 in. high; herbage minutely puberulent; leaves opposite, cauline, not reduced up the stem, simple

and linear or lanceolate, or palmately lobed into 3 to 7 similar lobes, firm, 3 to 10 lines long; flowers sessile, clustered in corymb-like cymes, or sometimes solitary or geminate; calyx-lobes lanceolate, about ½ as long as the tube; corolla salverform, white, rarely rose, 3½ to 5 lines long, the throat commonly yellowish, the tube shorter than or a little exceeding the calyx and usually a little exceeding the obovate corolla-lobes; stamens equal, inserted in the throat, included; capsule oblong.—Rocky or brushy slopes, 5500 to 12,000 ft., common: San Bernardino Mts.; White Mts.; Sierra Nevada; n. Humboldt Co. and Trinity Co. to Siskiyou Co. (3000 to 6000 ft.); n. to Wash., e. to Wyo. and N. Mex. (Gilia nuttallii Gray.) Var. FLORIBÚNDUM Jepson n. comb. Stems of the season many from a woody base, simple or sparingly branched, 5 to 12 in. high; herbage glabrous; leaves linear-filiform, 5 to 7 lines long; inflorescence open, the flowers commonly on slender pedicels, the pedicels 2 to 9 lines long.—Montane, 600 to 6000 ft.: Temescal and San Jacinto mountains to San Diego Co.; s. to L. Cal., e. to N. Mex. and Utah. (Gilia floribunda Gray.)

9. **LANGLOÍSIA** Greene

Low annuals. Leaves alternate, pinnatifid, the lower segments replaced by long bristles, the upper teeth or segments bristle-tipped. Flowers in terminal bracteate heads, the bracts with bristle-tipped lobes. Calyx-lobes equal, bristle-tipped, in fruit splitting to base. Corolla showy, tubular-funnelform, 2-lipped with 2 lobes in the upper lip and 3 in the lower, or equally 5-lobed with the lobes only obscurely disposed in 2-lipped fashion. Stamens inserted in the corolla-throat, often somewhat declined. Capsule many-seeded; seeds somewhat mucilaginous when wetted. (A. B. Langlois, a botanist of Louisiana.)

Leaves abruptly dilated at apex; corolla regular.
- Corolla-lobes about ⅓ as long as tube ..... 1. *L. setosissima.*
- Corolla-lobes little shorter than tube ..... 2. *L. punctata.*

Leaves pinnatifid, the rachis broad or ligulate; corolla strongly 2-lipped.
- Corolla-lobes ½ to ⅓ as long as the tube ..... 3. *L. schottii.*
- Corolla-lobes equaling or nearly equaling the tube ..... 4. *L. matthewsii.*

780. Langloisia punctata Hel.: *a*, habit x ⅘; *b*, leaf x ⅘; *c*, calyx and pistil x 1¼; *d*, long. sect. of corolla x 1¼; *e*, seed x 4.

1. L. setosíssima (T. & G.) Greene. Main axis short, erect, ¼ to 2¼ in. high, the branches spreading horizontally or ascending, ½ to 3¼ in. long; herbage subglabrous to puberulent; leaves 6 to 11 lines long, cuneately and somewhat abruptly dilated upward from a slender petiolar base, 3-toothed at apex and with a pair of teeth below these, all bristle-tipped; corolla lavender-blue, 6 to 7 lines long, the lobes about ⅓ as long.—Desert valleys and washes, 100 to 1000 ft.: Colorado Desert.

2. L. punctàta Hel. LILAC SUNBONNET. Fig. 780. Similar to no. 1; herbage glabrate; leaves with deltoid 3-toothed or 3-lobed apex, sometimes with a pair of teeth below the terminal teeth, the petiolar or cuneate base with 2 or 3-forked bristles; flowers subsessile; corolla-lobes purple-dotted, each with 2 very shallow longitudinal channels from above the middle towards the base, and ending below in a lunate yellow ridge; corolla-tube little surpass-

ing the calyx.—Ranges in the desert, 1700 to 4500 ft.: Mohave Desert; Inyo Co. (Gilia setosissima var. punctata Gray.)

3. **L. schóttii** (Torr.) Greene. Main axis very short, erect, ¾ to 2 in. high, the branches mostly divaricately spreading, 1 to 3 in. long; herbage villous-pubescent; leaves regularly pinnatifid, ½ to 1 in. long, the rachis very broad or ligulate, the teeth bristle-tipped or replaced by bristles; corolla pale pink, 6 to 9 lines long, the lower lip 3-lobed (the sinuses not so deep as the sinuses between the lips), these lobes spreading, purple-spotted or patterned, their sinuses with a small but distinct erect scale-like process; 2 lobes of upper lip more deeply parted than those of the lower, divergent, sometimes purple-dotted towards base.—Sandy washes on tilted mesas and in sandy valleys, 500 to 2700 ft.: coastal S. Cal. in Riverside Co.; Colorado Desert; e. Mohave Desert; e. to southern Utah and Ariz., s. to Sonora and L. Cal. Apr. Sometimes the lower lip is 4-lobed and the upper lip is a single lobe.

4. **L. matthéwsii** (Gray) Greene. Main axis very short, erect, 1 to 1½ in. high, bearing many horizontal or divaricate branches, forming a low plant 1 in. to 1¼ ft. broad; branches sparsely leafy or naked and peduncle-like, simple or branched above, ending in dense or head-like clusters of flowers, the heads leafy-bracteate; herbage thinly villous; epidermis of the stems white; leaves linear, ¼ to 1¼ in. long, regularly pinnatifid, the lobes spine-tipped or replaced by white bristles, the bristles often recurving; bracts linear, margined with long bristles; calyx about ⅔ as long as corolla, divided nearly to base into lanceolate lobes tipped with a long bristle; corolla white or pink, 5 to 7 lines long, the 3 upper lobes purple-spotted, also often with a double oblong pink pattern; stamens and style exserted.—Sandy washes, 600 to 3700 ft.: Colorado and Mohave deserts; Inyo Co.; e. to Nev. and Ariz., s. to Sonora.

10. GYMNÓSTERIS Greene

Diminutive annuals with leafless simple stems. Proper leaves none, the cotyledons persistent, connate-perfoliate. Flowers few in terminal heads, the 4 bracts united at base and forming a distinct involucre. Calyx-tube membranous, the teeth slightly unequal. Corolla salverform or slender-funnelform, white or yellow. Anthers sessile in the corolla-throat. Capsule dehiscent, many-seeded. (Greek gymnos, naked, and steris, robbed, referring to the leafless stems.)

Cotyledons remote from involucre; involucre several-flowered; style cleft ⅓: corolla-lobes acutish; var. parvula of ..... 1. *G. nudicaulis.*
Cotyledons closely subtending involucre or rarely somewhat removed; involucre 1 (or 3)-flowered; style cleft to middle or a little below; corolla-lobes obtuse ..... 2. *G. minuscula.*

1. **G. nudicáulis** (Gray) Greene var. **párvula** Jepson n. comb. Plants 1 to 1½ in. high; involucre 3 to 4½ lines long; corolla 3 to 4 lines long, its lobes acutish.—E. side Sierra Nevada in Nevada Co.; e. to Col., n. to Ida. (Gilia parvula Rydb.)

2. **G. minùscula** Jepson n. sp. Plants 2 to 3 lines high; calyx-lobes lanceolate, about as long as the tube; corolla yellow, 1¼ lines long, exceeding the calyx, its lobes short; capsule about 13 to 18-seeded.—Alpine gravelly or sandy slopes, 10,300 to 11,800 ft., White Mts., n. Inyo Co.: Sheep Mt. (Jepson 7326, type); Big Prospector Mdw.

HYDROPHYLLÀCEAE. Phacelia Family

Herbs or shrubs with opposite or alternate leaves. Flowers complete, regular, 5-merous (except the superior ovary which is 1 or 2-celled), in racemes or spikes (often scorpioid), or capitate, or solitary. Stamens 5, inserted near the base of the corolla, alternate with its lobes, which are imbricate in the bud. Styles 1, entire or often more or less 2-cleft at apex, or 2 and distinct. Fruit a 1-celled capsule or partly or quite 2-celled by the intrusion of the placentae or their union in the axis; valves 2, rarely 4. Seeds few or many. Seed-coat usually pitted, the cavities regular and honeycomb-like, or sometimes rugulose.

Styles 2 and distinct, or 1 and 2-cleft at apex; ovary hairy or pubescent, not glabrous except in no. 11.
Flowers in spikes, racemes, cymes or heads, or solitary in the axils of leafy stems.
Calyx-lobes or sepals essentially alike.
Stamens equal; style 2-cleft at apex; herbs.
Flowers not scorpioid; ovary with the placentae expanded, each forming a sac-like lining to the cell.
Stamens longer than the corolla; flowers in head-like clusters; leaves alternate or mainly basal.....1. HYDROPHYLLUM
Stamens shorter than the corolla; flowers solitary or in racemes; leaves (at least the lower) opposite.
Calyx with a reflexed appendage at each sinus.....
2. NEMOPHILA.
Calyx naked at the sinuses.....3. ELLISIA.
Flowers in scorpioid spikes, racemes or cymes.
Leaves all opposite, entire; ovary 2-celled.....4. DRAPERIA.
Leaves all or all but the lowest alternate; ovary more or less pubescent, the placentae narrow or thin, projecting into its cavity or meeting in the axis.
Corolla blue, purple or white, deciduous.....5. PHACELIA.
Corolla yellow or cream-color, persistent.
Flowers erect, on pedicels ⅛ to ¾ as long; calyx-lobes linear-oblanceolate; style (in ours) persistent.
6. MILTITZIA.
Flowers pendulous, on pedicels as long; calyx-lobes ovate; style deciduous.....7. EMMENANTHE.
Stamens unequal and unequally inserted; styles distinct to base (one and cleft at apex in some species in no. 9); herbs or herb-like (no. 10 shrubs).
Placentae with 2 or 3 ovules, the ovules superposed; small depressed repeatedly dichotomous annual.....8. LEMMONIA.
Placentae with several to numerous ovules.
Capsule more or less membranous, 2-valved, its placentae 6 to 50 (or more)-seeded; low annuals, or perennials of various habit.....9. NAMA.
Capsule coriaceous, 4-valved, when dehiscing behaving as if 4-celled, each cell 1 or 2-seeded; shrubs .10. ERIODICTYON.
Calyx-lobes strongly dissimilar, the 3 outer cordate, enlarged and veiny in fruit; herbs.....11. TRICARDIA.
Flowers solitary on a naked peduncle arising from a leaf-rosette on the ground; herbs.
12. HESPEROCHIRON.
Style 1, entire; ovary glabrous; flowers in racemes, white; leaves mainly basal; herbs....
13. ROMANZOFFIA.

1. **HYDROPHÝLLUM** Tourn. WATER-LEAF

Perennial herbs, ours with horizontal rootstocks, the leaves and peduncles sub-basal or on short stems. Leaves alternate, pinnately parted or divided. Flowers violet-blue or white, in cymose or head-like clusters. Calyx opening early, with or without a small appendage at each sinus, little changed in fruit. Corolla campanulate, the tube within bearing a pair of narrow longitudinal scales opposite each lobe, one on either side of the midrib, their edges meeting and forming a closed nectar-bearing groove. Filaments long, hairy at the middle, these and the styles long and filiform, conspicuously exserted. Ovules 4; seeds 1 to 4. (Greek hudor, water, and phullon, leaf.)

Stems very short, the peduncles and leaves mostly basal or sub-basal; rootstock short, densely set beneath with many fleshy tap-like roots; leaves pinnately divided, rarely subpalmate, the divisions mostly with obtuse or sub-acute lobes or teeth; pedicels much shorter than the calyces; montane.
Peduncles shorter than the petioles; blades roundish or ovate in outline, the 5 to 7 divisions entire or 1 or 2-incised at apex.....1. *H. capitatum.*
Peduncles longer than the petioles, often exceeding the subtending leaf; blades broadly oblong or elliptic in outline, the 7 to 15 divisions freely serrate or incised on the sides.....2. *H. occidentale.*
Stems about 9 to 12 in. high; peduncles commonly longer than the petiole of the subtending leaf; leaf divisions conspicuously serrate or incised, the lobes or teeth acute; pedicels mostly 1 to 2 times as long as the calyces; mts. along or near the north coast.
Leaves pinnately divided into 5 or 7 divisions; pubescence mostly soft..3. *H. fendleri.*
Leaves subpalmately divided; pubescence mostly hirsute.....4. *H. tenuipes.*

1. **H. capitàtum** Dougl. CAT'S BREECHES. Plants 4 to 9 in. high; peduncles much shorter than the petiole of the leaf, in fruit recurved, ½ to 1½ in. long. Pine woods, 4000 to 7000 ft.: Eldorado Co. to Modoc and Siskiyou Cos.; n. to Wash., e. to Utah. May-June.

2. **H. occidentàle** Gray. SQUAW LETTUCE. Fig. 781. Plants 5 to 15 in. high, the peduncles longer than the petioles, often longer than the leaves, bearing

1 or 2 capitate clusters of flowers; herbage hirsute, the leaves green above, white-pubescent beneath; leaves 5 to 12 in. long, their divisions or leaflets broadly oblong, entire or incised; heads 1 to 1¾ in. broad; calyx deeply parted, its divisions lanceolate; corolla pale blue or lilac, 4 to 6 lines long.—Montane, open pine woods or brushy slopes, 3500 to 7000 ft.: Tehachapi Mts.; Sierra Nevada from Tulare Co. to Modoc Co.; Santa Lucia Mts.; Mt. Diablo; Napa and Mendocino Cos. to Humboldt and Tehama Cos.; n. to Ore. Apr.-June.

781. Hydrophyllum occidentale Gray; *a*, habit x ⅛; *b*, fl. x 1.

3. **H. féndleri** Hel. var. **álbifrons** Mcbr. Plants erect, 8 to 14 in. high; herbage thinly soft-puberulent or rarely hirsute; leaves with mostly 5 or 7 divisions or leaflets, the leaflets ovate, deeply and irregularly incised or toothed, 1¼ to 2¾ in. long; flowers in usually somewhat compact cymes; corolla white, 3 to 5 lines long.—Damp shady places, 500 to 5500 ft.: mts. of Humboldt, Del Norte and w. Siskiyou Cos. Apr.-July.

4. **H. tenùipes** Hel. var. **víride** Jepson n. var. Plants erect, 10 to 20 in. high; herbage thinly hispidulose and the stems often conspicuously retrorse-bristly; leaves 4 to 7 in. wide, palmately 3-divided, the central division much larger and deeply 3-cleft, all the segments serrate and incised; corolla greenish-white.—Shady woods along the coast, 20 to 500 ft.: Mendocino and Humboldt Cos. (Ft. Bragg, W. C. Mathews, type); n. to Wash. May-June.

2. NEMÓPHILA Nutt.

Low annuals. Leaves mostly opposite. Flowers solitary in the axils or racemose. Calyx with a reflexed appendage in each sinus (rarely obsolete). Corolla white, blue, purple or variegated, basin-shaped or almost rotate to campanulate-tubular, with 10 minute internal scales in pairs between the stamens, at base. Stamens included, inserted at or near base of corolla. Style more or less 2-cleft. Capsule 1-celled. Seeds 2 to 25, usually with a deciduous caruncle. (Greek nemos, grove, and phileo, to love.) (?) VITICELLA Mitch.

Stems armed with retrorsely curved prickles; uppermost flowers clustered.
Petioles broadly winged and auriculate-clasping; corolla 8 to 11 lines broad..... 1. *N. aurita.*
Petioles not broadly winged nor auriculate-clasping; corolla about half as large..... 2. *N. racemosa.*
Stems not armed with prickles, although often retrorse-hairy; flowers all solitary and axillary.
Corolla commonly with a conspicuous purple blotch at apex of each lobe..... 3. *N. maculata.*
Corolla uniformly colored or veined or dotted.
Flowers large, 4½ to 16½ lines broad; calyx appendages much shorter than sepals.
Corolla blue or white; common .....4. *N. menziesii.*
Corolla with a large purple blotch on the lower part of each lobe; rare..... 5. *N. venosa.*
Flowers commonly smaller.
Calyx appendages either in flower or in fruit nearly equaling sepals.
Placentae 3 to 6-ovuled; corolla tubular or tubular-campanulate..... 6. *N. pedunculata.*
Placentae 2-ovuled; corolla open-campanulate or basin-shaped..... 7. *N. sepulta.*
Calyx appendages much shorter than the sepals.
Corolla 1½ to 2 times as long as calyx.
High-montane dwarf; leaves cuneate, 3-toothed at apex..... 8. *N. spatulata.*
Foothills; stems ½ to 2 ft. long; leaves mostly pinnately divided or pinnatifid.
Corolla rotate or basin-shaped.
Flowers commonly white; common, widely distributed... 9. *N. heterophylla.*
Flowers not white.
Flowers purple; scales wholly adnate; local, s. Sierra Nevada.....10. *N. pulchella.*

Flowers light blue; scales partly free above; coastal S. Cal. . . . . 11. *N. rotata.*
Corolla subcampanulate or bowl-shaped . . . . . 12. *N. exilis.*
Corolla scarcely or not at all exceeding the calyx . . . . . 13. *N. parviflora.*

1. **N. aurita** Lindl. FIESTA FLOWER. CLIMBING NEMOPHILA. Stem weak and straggling, angled or winged, armed with retrorse prickles which enable it to climb over other plants, 2 to 6 ft. long; leaves 1 to 2 in. long, coarsely, unequally and irregularly pinnately parted into 3 to 7 lobes, the lobes ½ to 1¼ in. long, often a little downwardly curved, the petioles broadly winged and auriculate-clasping; corolla deep purple or violet, paler outside, with short throat constricted below top, and spreading limb 8 to 12 lines broad.—Moist shady places in the foothills, 100 to 3000 ft.: coastal S. Cal.; n. in the Coast Ranges to San Francisco Bay and in the Sierra Nevada foothills to Tuolumne Co. Mar.-May.

2. **N. racemòsa** Nutt. Stems weak, simple or branched, ⅓ to 1⅓ ft. long; herbage hispid or setose-hispid, the stems retrorsely so; leaves round-ovate in outline, mostly very coarse, 1 to 2 in. long, pinnatifid into ovate or linear entire or toothed lobes, the lobes 3 to 8 lines long, ⅛ to ½ as broad; corolla campanulate, 1½ times as long as the calyx, the narrow scales free at the apex; capsule globose, shorter than the calyx, 1-seeded.—Hillslopes and ravines, 50 to 500 ft.: Santa Barbara Isls.; San Diego coast; s. to L. Cal. Mar.-Apr.

3. **N. maculàta** Benth. FIVE-SPOT. Stems several from the base, ascending or decumbent, 5 to 10 in. long; leaves broadly oblong in outline, 1 to 1½ in. long, pinnately parted into 5 to 9 ovate or suborbicular divisions or lobes, the lobes entire or 2 or 3-lobed; upper leaves (or sometimes all) usually with only 3 (or 5) entire lobes at tip and cuneately tapering base, or lanceolate and entire; peduncles surpassing the leaves; corolla white, with rows of purple dots radiating from the center to the large purple spot at the end of each lobe, 1 to 1⅛ in. broad; scales half free, rolled toward the filaments, ciliate.—Meadows, 1500 to 6500 ft.: Sierra Nevada foothills from Nevada Co. to Kern Co. Apr.-Aug. Also called Calico Flower and Spotted Nemophila. Var. CÓNCOLOR Brand. Leaves pinnatifid; corolla without purple blotches at tips of its lobes; scales oblong and half free.—Clear Creek, Butte Co.

4. **N. menzièsii** H. & A. BABY BLUE-EYES. Fig. 782. Stems branching from the base, slender or succulent, diffuse or ascending, 3 to 18 in. long; herbage more or less hirsute-pubescent; lower leaves 1½ to 3½ in. long, pinnately divided into 5 to 9 mostly 2 or 3-lobed divisions; upper leaves less divided; peduncles twice as long as leaves; calyx-lobes 2 to 5 lines long; corolla light to deep blue, often veined with purple, lighter and often dotted toward center, but seldom hairy, basin-shaped, divided about ¾ of the way to base, ½ to 1½ in. wide; scales broad and wholly adherent to narrow and part free, often enlarged at tip, laciniate, ciliate, or entire.—Moist spots on valley floors and hillsides, 20 to 5000 ft., common: cismontane Cal. (N. insignis Benth. N. intermedia Bioletti.) Extremely variable. Var. ATOMÀRIA Chandler. Pale Baby Blue-eyes. More succulent and less pubescent, often nearly glabrous; calyx-lobes shorter and broader; corolla white or pale blue, rather smaller, somewhat more deeply divided, dotted or rarely only veined dark purple or black, hairy at center; scales very narrow or linear, usually hairy, often reduced to a mere line of hairs.—Moist places, Coast

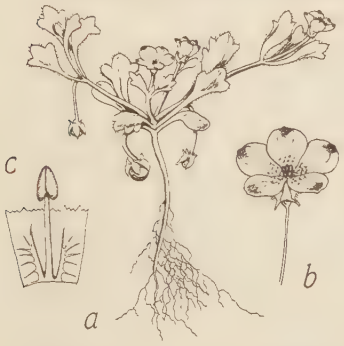
782. Nemophila menziesii H. & A.; *a*, habit x ½; *b*, scales and sect. of corolla base x 3.

Ranges. (N. atomaria F. & M.) Var. INTÉGRIFÒLIA Parish. Leaves entire or with 3 to 5 broad lobes; corolla white or light blue.—Mts. of S. Cal. Apr.-July.

5. **N. venòsa** Jepson. Similar to no. 4; corolla with a large purple blotch on each lobe and in throat, the pale blue upper portion of each lobe conspicuously purple-veined.—Mts. of Napa and Sonoma Cos.

6. **N. pedúnculàta** Dougl. Stems prostrate or among underbrush lax, sparingly pubescent, 2 to 6 (or 12) in. long; leaves oblong, 5 to 7-lobed or -divided; peduncles shorter than the leaves, strongly deflexed in age, burying the capsules; corolla white or pale blue, often black-dotted, the scales linear, often reduced to hairy lines; style as long as ovary or longer.—Damp places in the foothills or mts., grassy slopes and shade of thickets, 50 to 6000 ft.: Modoc and Lassen Cos. w. to Humboldt Co., thence s. along the coast to San Diego Co.; not common. Apr.-May.

7. **N. sepúlta** Parish. Stems usually prostrate, the branches often strongly angled or winged, 2 to 5 (or 15) in. long; leaves oblong, pinnately parted into 5 or 7 oblong lobes; peduncles deflexed in age; corolla open-campanulate, not hairy at center, whitish, often dotted with blue or purple toward the center, 2 lines broad; scales linear or reduced to hairy lines; capsules a little broader than long, 2¾ lines broad.—Mts., 1500 to 4000 ft., widely distributed in Cal. but not common. Mar.-Apr.



783. Nemophila spatulata Cov.; *a*, habit x ½; *b*, fl. x 2; *c*, stamen and scales x 4.

8. **N. spatulàta** Cov. Fig. 783. Stems few from the root-crown, 1 to 2½ (or 4) in. long (rarely to 8 in. long), diffuse or prostrate; herbage hispidulose; leaves cuneate or linear-cuneate, coarsely 3 (rarely 5 or 7)-toothed at apex, ½ to 1¼ in. long; corolla bluish or white, often with a purple spot at tip of each lobe and a few dots in center, 3 lines long; scales small and laciniate or obsolete; style cleft at apex. —Montane ridges in pine forests, 5000 to 9000 ft.: Sierra Nevada from Nevada Co. to Tulare Co.; Tehachapi Range; s. to San Jacinto Mts.; w. Nev. May-June. (N. humilis Eastw.)

9. **N. héterophýlla** F. & M. SMALL WHITE NEMOPHILA. Stems erect, ascending or lax, 8 to 13 in. long; herbage thinly hirsute or hirsutulose; leaves pinnately divided or cleft into 5 or 7 oblong or elliptic divisions; calyx-appendages evident; corolla white or bluish, devoid of blue or purple dots, basin-shaped or broadly campanulate, not hairy within, 3 to 4½ lines broad; scales semi-circular, oblong or triangular, entire or laciniate, not reduced to hairy lines.—Cañons and hillslopes, mostly in shady spots, 20 to 4000 ft. in the foothills: Coast Ranges and Sierra Nevada. It is the most common species and is extremely variable. Var. FLÁCCIDA Brand. Upper leaves (or sometimes all) broadly 1 or 2-toothed or -cleft or subentire.—Mendocino, Shasta and Butte Cos. (N. flaccida Eastw.) Var. NEMORÉNSIS Jepson n. comb. Scales narrowly linear or almost obsolete.—Near the coast, Marin Co. to Santa Clara Co. (N. nemorensis Eastw.)

784. Nemophila pulchella Eastw.; *a*, fl. branchlet x 6/7; *b*, gland x 19.

10. **N. pulchélla** Eastw. Fig. 784. Similar to no. 8; calyx-appendages minute or even obsolete; corolla deep blue or purplish, rotate or basin-shaped; scales broadly linear, wholly adnate, ciliate or not, or reduced to short-hairy bands.—Foothills, 500 to 4800 ft.; s. Sierra Nevada from Fresno Co. to Kern Co. Apr.

11. **N. rotàta** Eastw. Similar to no. 9; corolla light blue, saucer-shaped, 4 lines broad; scales linear, deeply and finely fimbriated, partly free above.—Valleys and mesas, coastal S. Cal.

12. **N. exìlis** Eastw. Stems diffuse, 6 to 12 in. long; herbage hirsute or hirsutulose; leaves ½ to 1 in. long, pinnately divided into 5 or 7 divisions or lobes, the lobes oblong, ovate or roundish, contracted or broadly petiolulate at base, sometimes again 3-lobed; upper leaves (or again sometimes all) merely coarsely or irregularly few-toothed or lobed, or even nearly entire; corolla white, broadly campanulate or bowl-shaped, (1½ or) 2½ to 4 lines broad; scales narrow, the pairs divergent.—Foothills, 500 to 5000 ft.; Coast Ranges from Santa Clara Co. to Mendocino Co.; Sierra Nevada foothills from Tulare Co. to Butte Co. Apr.-May.

13. **N. parviflòra** Dougl. SMALL-FLOWERED NEMOPHILA. Stems decumbent or ascending, hispid, ½ to 1¼ ft. long, leaves suborbicular to roundish-ovate in outline, 4 to 12 lines long, pinnately cleft into 5 lobes (or sometimes merely dentately 5-toothed), the lobes acute; peduncles shorter than leaves, not deflexed in age; corolla scales minute, various, but usually half free and laciniate or ciliate; style as long as the ovary or longer.—Foothills and cañons, moist or shady places, 50 to 4500 ft.: Coast Ranges from Santa Cruz Mts. to Humboldt and Trinity Cos.; Sierra Nevada from Fresno Co. to Plumas Co.; n. to Wash. Mar.-Apr. Var. AUSTÌNAE Brand. Leaves shallowly lobed, the lobes more nearly rounded.—Siskiyou Co.; Plumas Co., passing into the next variety. Var. QUERCIFÒLIA Chandler. Oak-leaf Nemophila. Pubescence softer and more spreading than in the species; leaves roundish or ovatish in outline, 6 to 9 lines long, sinuately parted or divided into about 5 lobes, the lobes rounded and tending to be broader towards the apex; peduncles mostly exceeding the leaves.—Sierra Nevada, 1500 to 5000 ft. (N. quercifolia Eastw.)

3. ELLÍSIA L.

Annuals, similar to Nemophila. Leaves opposite or the uppermost alternate, pinnately parted or twice or thrice pinnately dissected. Flowers bractless, in axillary peduncled racemes. Calyx without appendages at the sinuses, and usually much enlarged under the fruit. Corolla white, campanulate, shorter or little longer than the calyx, the internal scales minute or none. Ovules 4 to 8. Seeds not carunculate. (John Ellis, English botanist of the 18th century, whom Linnaeus called a "bright star of natural history.")

Sepals sparsely bristly or ciliate, not glandular.
Leaves once pinnately parted, the lobes remote; ovules 2 on each placenta, borne on the front of it. . . . . 1. *E. membranacea.*
Leaves twice or thrice pinnatifid; ovules 4 on each placenta, 2 on the front and 2 on the back.
Corolla 1½ to 2 times as long as calyx; flowers many or numerous, racemose or commonly paniculate; erect plants; coastal. . 2. *E. chrysanthemifolia.*
Corolla not exceeding calyx; flowers few in a raceme; diffuse plants; deserts. . . 3. *E. torreyi.*
Sepals sparsely bristly and also sprinkled with black short stipitate glands; leaves once pinnately parted. . . . . 4. *E. micrantha.*

1. **E. membranàcea** Benth. Fig. 785. Stems procumbent, 1 to 2 ft. long; herbage glaucous, the leaves with a few short scattered stiff hairs, the stems with minute prickles on the angles; leaves ovate in outline or often nearly as broad as long, 1 to 5 in. long, pinnately divided, with 2 broad lobes (obtuse at apex and broadest at base) spreading at right angles to the terminal lobe, or often with 4 to 8 similar lateral lobes, the lobes remote; petiole wing-margined; flowers racemose, few or many on the peduncles; calyx without appendages, its lobes ciliate-bristly; corolla white with a small lance-shaped purple spot in the center of each lobe, 2 lines broad, no scales in the throat but with 10 glandular elevations; capsule often purple in age, with several muricate prickles, 1 or 2-seeded; seed globose, reticulated.—Shady

places in the foothills: San Diego to Mt. Diablo, e. to Tulare Co., Mohave Desert and west side Colorado Desert.

2. **E. chrysánthemifòlia** Benth. Stem often stout, erect, freely branching, ½ to 2 ft. high; herbage thinly short-hirsute with spreading hairs, or the leaves hispidulose; leaves ovate in outline, 2 to 4 in. long, twice to thrice pinnately dissected or incised, shortly petioled or subsessile, with a conspicuous auriculate dilation at base; flowers loosely racemose; corolla open-campanulate, surpassing the oval calyx-lobes; scales in tube a diverging pair to each stamen; capsule whitish, thinly hirsute, the placentae lining and exactly conforming to the valves; placentae with two roughened seeds borne on the front of each, and 2 smooth ones concealed behind each, that is, between the placentae and the valves.—Shady places along the coast: Contra Costa Co. to San Diego Co.

785. Ellisia membranacea Benth.; *a*, fl. branch x ⅔; *b*, fl. x 1½; *c*, pistil x 4½; *d*, gland x 7.

3. **E. tórreyi** Gray. Similar to no. 2; stems weak, diffuse, 6 to 13 in. long; herbage thinly soft-hairy or pilose; leaves ½ to 1¼ in. long, pinnately parted, the lobes incised or toothed; upper leaves with a dilated auriculate base, the lower petioled; racemes few-flowered; corolla broadly campanulate, not exceeding calyx.—Mohave and Colorado deserts; e. to Ariz.; s. to L. Cal.; rare.

4. **E. micrántha** (Torr.) Brand. Stems erect, branching from the base, slightly glandular-pubescent or subglabrous, 5 to 10 in. high; leaves oblong in outline, ½ to 1 in. long, pinnately parted, the lobes entire or rarely 1-toothed; lower leaves petioled, the upper auriculate-dilated at the sessile base; flowers many in racemes and subpaniculate; corolla white, deeply bowl-shaped, 2 lines long, the lobes quadratish, emarginate; stamens unequal, 3 longer, a yellowish spot on corolla between the filaments.—Washes and mesas, often in shade, 300 to 7500 ft., rather infrequent: Colorado and Mohave deserts; Inyo Co.; e. to Utah and western Tex.; s. to L. Cal. and Sonora. (Phacelia micrantha Torr.)

786. Draperia systyla Torr.; *a*, portion of fl. stem x ½; *b*, long. sect. of fl. x 1½; *c*, capsule x 2.

4. DRAPÈRIA Torr.

Low diffuse perennial herb with slender stems and opposite entire leaves. Flowers in a terminal cyme, its branches consisting of unilateral racemes. Calyx-segments linear. Corolla pale lavender, tubular-funnelform, without appendages. Stamens unequal and unequally inserted low on the corolla-tube, included. Ovary 2-celled, the ovules in each cell 2, pendulous. Style long, filiform, 2-cleft at apex. Capsule subglabrous. (J. W. Draper, American historian.)

1. **D. sýstyla** Torr. Fig. 786. Stems few or several, 4 to 7 in. long, arising from the horizontal rooting branches of a large root-crown; herbage silky-hirsute; leaves ovate, entire, ¾ to 1¾ in. long; corolla 5 to 6 lines long; ovary densely hairy.—Pine woods, 4000 to 5500 ft.: Sierra Nevada from Tulare Co. to Shasta Co.; Siskiyou Co. June-July.

5. PHACÈLIA Juss.

Perennial or annual herbs of marked aspect, with alternate leaves (or sometimes the lower opposite). Flowers violet, blue or white, in scorpioid spikes or racemes. Calyx of 5 nearly distinct sepals, commonly accrescent. Corolla from nearly rotate to campanulate, tubular or funnelform, promptly deciduous, the tube commonly with internal lamellate projections or scales. Stamens inserted on the base of the corolla. Style 2-cleft or -parted, or divided to the base. Capsule 1-celled or nearly or quite 2-celled by the approximation or union of the placentae in the axis, 2-valved, the thin septa-like placentae adherent to the valves. Seeds reticulate-pitted or favose or transversely corrugated. (Greek phakelos, a cluster, many species with crowded flowers.)

A. Seeds commonly reticulate or favosely pitted, never transversely corrugated.

I. Scales (if present) free from corolla; annuals.

Corolla scales none; corolla deeply saucer-shaped; ovules 20 to 80 on each placenta.—Subgenus Gymnobythus.
- Corolla blue with white or purple center, mostly 6 to 9 lines broad.....1. *P. viscida.*
- Corolla pale blue or purplish without white center, ¾ to 2 in. broad.....2. *P. grandiflora.*

Corolla scales present, adnate to lower portion of filament; ovules 8 to 50 on each placenta.—Subgenus Whitlavia.
- Corolla open-campanulate or somewhat bowl-shaped, cleft to the middle or below; ovules not very numerous.
  - Ovules about 20 to each placenta; corolla deep violet, ¾ to 1 in. broad; cleft below the middle.....3. *P. parryi.*
  - Ovules 8 to 10 to each placenta; corolla white, 3 to 6 lines broad, cleft to the middle.....4. *P. longipes.*
- Corolla oblong-campanulate, not cleft to the middle; ovules more numerous (20 to 50 to each placenta).....5. *P. minor*

II. Scales commonly adnate to the corolla-tube.

1. Ovules always 2 to each placenta.—Subgenus Euphacelia.

a. Leaves entire, or pinnately parted or divided and the lobes entire.

Coarse perennials with stout stems 1¼ to 3½ ft. high; corolla commonly white.
- Herbage pubescent and hirsute; plants of rocky and usually dry places.
  - Leaves entire or with 1 pair of supplementary lobes at summit of petiole; montane or high-montane, at least mostly.
    - Sepals bristly and finely pubescent, not venulose; leaves not glaucous.....6. *P. heterophylla.*
    - Sepals bristly mostly or only on margins, transversely venulose; leaves subglaucous beneath.....7. *P. corymbosa.*
  - Leaves pinnatifid with usually large terminal lobe, rarely entire; mostly foothills or middle altitudes.....8. *P. californica.*
- Herbage hispid-bristly with stinging hairs; plants of shady moist places.....9. *P. nemoralis.*

Annuals with stems 2 to 9 in. high; corolla commonly blue, rarely whitish.
- Leaves mostly incisely lobed or parted; racemes rather lax but many-flowered; style parted scarcely to the middle; Coast Ranges.....10. *P. breweri.*
- Leaves entire or essentially so; Sierra Nevada or mts. of S. Cal.
  - Style parted to base; corolla 1 to 1½ times as long as calyx; stem branching at or near the base.....11. *P. eisenii.*
  - Style parted to middle or just below middle.
    - Corolla long-persistent, 2 times as long as calyx or nearly; scales very long and very narrow; rare.....12. *P. marcescens.*
    - Corolla deciduous.
      - Racemes rather densely flowered.
        - Scales with the outer edges free; common.....13. *P. humilis.*
        - Scales of contiguous pairs with the outer edges partly connivent in pairs; rare.....14. *P. irritans.*
      - Racemes not densely flowered; stem simple below, the branches in opposite pairs at or above the middle; frequent...15. *P. racemosa.*

b. Leaves cleft, parted or divided, but whether cleft, parted or divided the lobes or divisions in any case crenate or toothed; annuals except no. 19.

Leaves divided, that is mostly with distinct or discrete divisions or leaflets.
- Divisions of leaves mostly rather delicate with numerous lobes, teeth or scallops, the whole more or less fernlike in appearance.

Sepals unlike, 1 or 2 of them dilated and leaf-like and often toothed or cleft; Sierra Nevada foothills.....16. *P. platyloba*
Sepals essentially alike.
Stamens much-exserted; Sacramento Valley to S. Cal....17. *P. tanacetifolia.*
Stamens little or not at all exserted; mostly Coast Ranges and coastal S. Cal.. 18. *P. distans.*
Divisions of leaves or leaflets coarser, the teeth or scallops fewer and larger.
Perennial; herbage somewhat glandular; corolla yellowish-white or bluish; stamens somewhat exserted.....19. *P. ramosissima.*
Annuals.
Corolla longer than calyx.
Stamens not or scarcely surpassing the blue or lavender corolla; divisions of leaves or leaflets without petiolules; style cleft halfway or below.
Sepals narrow-oblanceolate, very narrow-attenuate downward, never becoming chartaceous.
Scales wholly adnate to corolla; common.....20. *P. hispida.*
Scales with a bristle-like apex projecting into tube; rare.... 21. *P. eremica.*
Sepals oblong to broadly ovate, in fruit becoming chartaceous.... 22. *P. ciliata.*
Stamens well-exserted from the white corolla; sepals linear or oblanceolate; divisions of leaves or leaflets mostly with petiolules.. 23. *P. pedicellata.*
Corolla shorter than calyx; stamens included.....24. *P. cryptantha.*
Leaves toothed or cleft, seldom divided (except in P. crenulata).
Leaves oblong to linear-oblong, crenately lobed or pinnatifid; stamens well-exserted... 25. *P. crenulata.*
Leaves round- or elliptic-ovate, slightly lobed; sepals unequal.
Racemes dense, many-flowered; stamens and style exserted....26. *P. malvaefolia.*
Racemes slender, becoming loose, fewer-flowered; stamens and style included.. 27. *P. rattanii.*

2. Ovules usually more than 2 to each placenta.—Subgenus EUTOCA.

a. Perennials.

Leaves 3 to 6 lines long, as broad as long; main stems white-woolly; Panamint Mts..... 28. *P. perityloides.*
Leaves much larger (1 to 7 in. long), longer than broad; stems never white-woolly.
Stamens strongly exserted; leaves not glandular nor harsh-hairy.
Stem branched, 4 to 10 in. high; leaves silky-pubescent on both sides; Sierra Nevada.....29. *P. hydrophylloides.*
Stem simple, 3 to 7 ft. high; leaves puberulent; mts. of n. Cal....30. *P. procera.*
Stamens little or not at all exserted; leaves glandular or harsh-hairy, merely toothed or cleft, rarely divided; north coast.....31. *P. bolanderi.*

b. Annuals.

Leaves pinnately parted or divided.
Plants robust, 1 to 2 ft. high; racemes congested in a terminal cymose panicle; leaves bipinnately parted; Santa Catalina Isl.....32. *P. lyoni.*
Plants slender, the stems commonly 3 to 10 in. long; pedicels retrocurved, at least in age.
Leaves pinnately and often finely parted.....33. *P. douglasii.*
Leaves mainly entire or merely coarsely toothed.....34. *P. davidsonii.*
Leaves entire or toothed or cleft, sometimes parted or divided toward base.
Leaves cordate at base, mostly broader than long.....35. *P. rotundifolia.*
Leaves not cordate, longer than broad.
Pedicels curved or retrocurved-spreading in age; stamens included; filaments a little hairy; dwarf (mostly only 1 to 3 in. high).....36. *P. curvipes.*
Pedicels straight (1½ lines long to almost none).
Leaves linear or oblanceolate, mostly entire.
Herbage hirsute and minutely pubescent; stems ½ to 1 or 1½ ft. high; style cleft ⅓.....37. *P. linearis.*
Herbage glandular; stems 2 to 10 in. high; style cleft about ⅔.
Stamens conspicuously exserted; herbage hispid as well as glandular; mts. bordering Mohave Desert..38. *P. mohavensis.*
Stamens included; herbage not hispid; mts. of n. Cal..... 39. *P. pringlei.*
Leaves broader, orbicular, ovate or broadly oblong.
Style bifid or cleft near the apex; stamens included.
Corolla 4½ to 7 lines long; leaves entire or with 1 or 2 lobes or teeth near base.....40. *P. divaricata.*
Corolla 2 to 4 lines long; leaves crenate or dentate.
Plants 3 to 10 in. high; desert plants.
Stems few to several from base; corolla blue or bluish.. 41. *P. parishii.*
Stem simple at base, branched above; corolla white..... 42. *P. lemmonii.*
Plants 1 ft. high; corolla light blue; cent. Coast Ranges..... 43. *P. suaveolens.*
Style cleft or parted to near the middle or below.
Divisions of style short, not exserted from corolla..... 44. *P. phacelioides.*

Divisions of style long, well-exserted from corolla.
Stamens exserted.
Corolla nearly white; ovules 5 or 6 to each placenta; Santa Lucia Mts. ..... 45. *P. grisea.*
Corolla violet; ovules 2 to 4 to each placenta; s. Sierra Nevada ..... 46. *P. purpusii.*
Stamens included; Mariposa Co. ..... 47. *P. vallicola.*

B. Seeds transversely corrugated; corolla with scales distinct or indistinct or none; ovules more than 2 to each placenta; deserts or mountain ranges bordering them (except no. 52).—Subgenus MICROGENETES.

Leaves pinnately divided or pinnatifid into many or numerous lobes or divisions, the divisions rather fine (mostly 1 to 2 or 3 lines long) or somewhat larger in no. 49.
Corolla small, shorter than or only slightly exceeding calyx; scales inconspicuous or wanting.
Sepals linear, slightly dilated and often recurved or spreading at apex; stems diffuse or ascending ..... 48. *P. ivesiana.*
Sepals strongly spatulate, straight; stems erect ..... 49. *P. affinis.*
Corolla 2 or 3 times longer than calyx.
Corolla scales connate their whole length with the filaments ..... 50. *P. bicolor.*
Corolla scales entirely free from the stamens, or none.
Corolla 5 to 7 lines long ..... 51. *P. fremontii.*
Corolla not more than 3 lines long.
Corolla open-campanulate, often as broad as long .... 52. *P. brachyloba.*
Corolla narrowly tubular-campanulate ..... 53. *P. hallii.*
Leaves round-ovate, subcordate at base, entire or crenate, not pinnatifid; stamens included; style cleft ⅓ to ½; capsule globose, the calyx ⅗ to as long.
Corolla 1½ times longer than the calyx; small dwarfs ..... 54. *P. pachyphylla.*
Corolla 2 to 3 times longer than calyx; robust plants ..... 55. *P. calthifolia.*

I.—Subgenus GYMNOBYTHUS. Corolla without scales; ovules 20 to 80 to each placenta; seeds small, not transversely corrugated.

1. **P. víscida** Torr. Stems ⅔ to 2 ft. high, simple or slightly branching; herbage densely viscid-glandular and hirsute-pubescent; leaves broadly ovate or roundish, cuneate or truncate at base, doubly serrate or irregularly dentate, ½ to 1 or 3 in. long, short-petioled or the upper sessile; flowers few to many in a single terminal raceme; calyx-lobes linear to almost spatulate, about equaling the capsule; corolla deeply saucer-shaped or rotate-campanulate, deep blue with purple or whitish center 6 to 9 (or 11) lines broad; stamens included; filaments very slender, sparingly pilose-hirsute.—Open ground along the coast, 50 to 1500 ft.: San Luis Obispo Co. to San Diego Co.; s. to L. Cal. Apr.-June. Var. ALBIFLÒRA Gray. Corolla white.—S. Cal.

2. **P. grandiflòra** (Benth.) Gray. Similar to no. 1; plants larger throughout, 2 to 3 ft. high, more robust and hispid-viscid; leaves 2 to 6 in. long, the petioles 1 to 4½ in. long; corolla 1⅛ to 2 in. broad.—Along S. Cal. coast from Santa Inez Mts. to San Diego, 500 to 2000 ft. Apr.-June. (Eutoca grandiflora Benth.)

II.—Subgenus WHITLAVIA. Corolla scales free from corolla except at base, adnate to the lower portion of the filament; style much longer than calyx or ovary; seeds not transversely corrugated; ovules 8 to 50 on each placenta.

3. **P. párryi** Torr. Stem erect, simple or sparingly branched above, ½ to 1½ ft. high; herbage glandular-puberulent and hirsute or even hispid; leaves ovate, obtuse to sub-cordate at base, irregularly double-toothed or laciniate, ¾ to 2 in. long, the lower long-petioled, the upper cauline shortly petioled or almost sessile; racemes loose, elongated in age; pedicels widely spreading, slender, ¼ to 1 in. long; sepals linear; corolla open-campanulate, cleft below the middle, royal purple or deep violet with a yellowish or whitish 5-rayed center, 5 to 6 lines long, ¾ to 1 in. broad, about twice the length of the calyx-lobes; filaments pilose, equaling or slightly exceeding the corolla; ovary with a row of hairs at apex on each side midway between placentae; style sparsely hispid, divided ⅓ to ½ the way down.—Valleys and hillslopes, 600 to 2500 ft.: Santa Lucia Mts. to San Diego, thence e. to west side Colorado Desert; s. to L. Cal. Mar.-June. The foliage stains paper brownish.

4. **P. lóngipes** Torr. Stems erect or ascending, freely branching at or above the base, 3 to 12 in. high; herbage hirsute and densely glandular throughout; leaves cordate at base, usually rounded at apex, ovate or orbicular, coarsely and obtusely crenate, 1 to 1¾ in. long; the petioles mostly

much longer; racemes loose, the lower pedicels becoming ¾ to 2¼ in. long; sepals linear-spatulate, 2 to 3 lines long; corolla white, open-campanulate, usually parted to the middle, 4 to 6 lines long; scales glabrous; stamens slightly pilose at or near the base, little longer than the corolla; style pilose, deeply 2-cleft; "ovules about 8 to each placenta."—Mts. of coastal S. Cal. from Santa Barbara Co. to San Diego Co., 3000 to 7500 ft. Apr.-June.

5. **P. minor** (Harvey) Thell. CALIFORNIA BLUE-BELL. Stem erect, simple or branching, hispid with short spreading hairs, ½ to 2 ft. high; herbage glandular-viscid throughout; leaves broadly or round-ovate, truncate or cordate at base, coarsely and sometimes doubly serrate, hispid, 1 to 2½ in. long, the lower long-petioled, the upper short-petioled or nearly sessile; racemes elongated; lower pedicels ½ to 1½ in. long; sepals linear, 4 lines long; corolla blue or purple, long-tubular, as broad or even a little broader below than above (that is at the throat), ¾ to 1¼ in. long, 3 to 5 lines broad; stamens scarcely if at all exceeding the corolla; scales hairy.—Valleys and mesas, 500 to 4000 ft.: Los Angeles and San Bernardino Valley to San Diego Co. and e. to west side of Colorado Desert; L. Cal. (P. whitlavia Gray.) Var. CAMPÁNULÀRIA Jepson n. comb. Leaves ½ to 3 in. long, long-petioled; raceme loose, elongated; fruiting pedicels usually exceeding the calyx; sepals decidedly glandular, 4 to 7 lines long; corolla deep blue (the tube widened upward), scarcely if at all ventricose, ¾ to 1⅜ in. long; scales glabrous or sometimes hairy.—Desert ranges, 800 to 4000 ft.; Mohave and Colorado deserts. Apr.-May. (P. campanularia Gray.)

III.—Subgenus EUPHACELIA. Ovules 2 to each placenta; lower part of the corolla-tube with 10 scales, each attached by one side to the corolla-tube, and by the other side to the base of a stamen; seeds not transversely corrugated (or in a few species corrugated on the margin).

6. **P. heterophýlla** Pursh. Stems several from the base, erect, 2 to 2½ ft. high, scantily to grayish-hirsute; leaves mostly cauline, lanceolate to broadly elliptical, with a pair of reduced leaflets at base, greenish to grayish with short appressed pubescence, 1 to 2 in. long; racemes 1 to 1¾ in. long, so disposed as to be openly paniculate; sepals linear; corolla white, 2½ lines long; scales narrow, wholly adnate, one each of adjacent pairs connivent by their free edge; stamens exserted, long-hairy at the middle.—Montane, 5000 to 7000 ft.: Sierra Nevada from Tulare Co. to Placer Co., n. to B. C. and Ida., e. to Ariz. Var. GRÍSEOPHÝLLA (Brand) Mcbr. Stems ⅔ to 1½ ft. high; leaves lanceolate to narrowly elliptic, acute, mostly entire or with a pair of reduced leaflets at base, greenish to grayish with a spreading hirsute pubescence, 1¼ to 2 in. long, a few of the basal leaves long-petioled; inflorescence loose.—Montane, 4000 to 7200 ft.: San Bernardino Mts.; Sierra Nevada from Tulare Co. to Nevada Co. and Modoc Co.; Mendocino Co. to Siskiyou Co. (P. magellanica f. griseophylla Brand.) Var. FRÍGIDA Jepson n. comb. Plants usually compact and low, the stems ascending or diffuse, nearly naked, 3 to 10 in. high; basal leaves lanceolate to oblong, acute, commonly entire, grayish-hirsute, rarely sub-silky, 1 to 2 in. long, tapering into a petiole ¼ to as long; cauline leaves few or almost none, similar, short-petioled or the upper subsessile; racemes rather short, usually in a rather compact panicle.—Montane, 6000 to 13,000 ft.: San Jacinto Mts.; San Bernardino Mts.; White Mts.; Sierra Nevada from Tulare Co. to Lassen Co.; Yollo Bolly Mts. to Mt. Shasta. (P. frigida Greene.) Var. COMPÁCTA Jepson n. comb. Stems many, ascending from the freely branched crown of a stout taproot, 7 to 9 in. high, pubescent; leaves linear-oblanceolate or linear, acute, gradually narrowed at base to a petiole, entire or with a pair of small lobes at base, densely appressed-silky, 1 to 2 in. long; racemes rather short in a compact panicle; corolla white.—Mts. bordering or near the w. side of the Great Basin, 6000 to 9000 ft.: Marble Mt., w. Siskiyou Co.; Mt. Shasta; mts. about Lake Tahoe; w. Nev. (P. compacta Greene). Var. PYGMAÈA Jepson n. var. Plant very much condensed, tufted, 2 to 4 in. high; leaves oblong-lanceolate, appressed white-silky, 4 to 9 lines long, short-petioled; panicle of racemes reduced to a small head or nearly.—Mt. Shasta, 9000 ft. (Jepson, type). Var. DASYPHÝLLA Jepson n. comb. Similar in habit to var. pygmaea; filaments very slightly or obscurely hairy and only below the middle.—Alpine, 11,400 to 12,600 ft.: Silver

787. Phacelia californica Cham.; *a*, leaf x ⅓; *b*, panicle x ½; *c*, corolla spread open x 2; *d*, cross sect. ovary x 10.

Pass, Fresno Co.; Mt. Whitney. (P. dasyphylla Greene.)

7. **P. corymbòsa** Jepson n. sp. Stems few or several, very slender, almost naked, erect or ascending from a basal or subbasal tuft of many leaves, 11 to 14 in. long; herbage hirsute and minutely puberulent, the stems glandular-hirsute above, the leaves greenish-white or subglaucous beneath; leaves broadly oblong, entire, acute at base and apex, 1 to 1½ in. long, rather definitely though not abruptly petioled, the petioles half to as long; racemes subumbellately disposed or corymbose, 1 to 3 in. long; flowers somewhat discrete, at least not densely crowded; sepals oblong, somewhat bristly, especially on the margins, transversely venulose; corolla white, 3 lines long.—Upper Sacramento River (Dunsmuir, 2200 ft., Jepson 6161, type).

8. **P. californica** Cham. ROCK PHACELIA. Fig. 787. Stems stout, simple, erect, 1¼ to 2 ft. high, usually several from the root-crown; stems and petioles hispid, sometimes very sparsely so, the blades strigose, either green or canescent; leaves pinnate or pinnatifid, the large terminal lobe elliptic to lanceolate, 2 to 4 in. long, with 1 to several pairs of smaller or much reduced leaflets or lobes below, or entire; petioles commonly long; racemes dense, 1 to 2 in. long, mostly rather short-peduncled and disposed in a terminal panicle; sepals oblong; corolla commonly purple, 3 lines long.—Rocky points or ledges, near the coast, 20 to 1500 ft.: Marin, w. Contra Costa, w. Alameda and San Francisco Cos. to Monterey Co. Var. IMBRICÀTA Jepson. Stems 2 to 2½ ft. high; racemes 2 to 4 in. long, many in an often large panicle (less commonly in 2s and 3s), mostly on long peduncles; corolla dingy white; fruiting calyces ovate or broad, conspicuously imbricated.—Dry rocky foothills, 300 to 3000 ft., mostly toward the interior: Coast Ranges; Sierra Nevada foothills; cismontane S. Cal. Var. VIRGÀTA Jepson n. comb. Stem stout, simple, usually erect, 1 to 3¾ ft. high, leafy at base and to the middle of the stem, thence with the many racemes compactly virgate-racemose to the summit; stem and petioles sparsely or densely coarse-hispid with a dense almost plush-like short indument beneath; leaves pinnately divided to entire, appressed-pubescent.—Montane, 2000 to 6000 ft.: Mendocino Co. to Shasta and Siskiyou Cos.; Modoc Co. to Nevada Co. One of the most well-marked forms of this variable group, but intergrading, especially at the limits of its range, with var. imbricata. (P. virgata Greene). Var. RUBÀCEA Jepson n. var. Somewhat similar to var. virgata, but the branches of the main axis (especially the lower) more or less elongated and bearing subumbellate or corymbose clusters of racemes, the whole inflorescence loosely paniculate; sepals becoming red, bristly-ciliate.—Lower slopes of Mt. Konocti, Lake Co. (Jepson, type). Var. BERNARDÌNA Jepson n. comb. Stems 1 to 1½ ft. high; sepals ovate, obtuse or acutish.—Mts. of S. Cal., s. to L. Cal. (f. bernardina Mebr.) Var. PÁTULA Jepson n. comb. Stems erect, ascending or decumbent, nearly naked, 5 to 12 in. high; leaves mostly basal, ovate or elliptic-ovate with 2 or 3 pair of supplementary lobes below, or deeply pinnatifid; sepals narrowly obovate to lanceolate or linear-lanceolate.—Mts., 5500 to 8000 ft.: cent. and s. Sierra Nevada; mts. of S. Cal. (P. magellanica f. patula Brand. P. californica f. ballii Mebr.)

9. **P. nemoràlis** Greene. Stems 1 or few from the base, simple below, paniculately branched above, 1¼ to 3 ft. high, very bristly with stinging hairs; herbage light green; leaves elliptical to oblong, 1 to 4 in. long, simple and entire or with a pair of small leaflets at base; basal and lower leaves on petioles 2 to 3 in. long, uppermost short-petioled or sessile; racemes 1½ to 2½ in. long, slender, in 2s or 3s, terminating the stems or lateral branches; corolla whitish, 2 lines long; capsule 2-seeded.—Shade of woods or brush in the foothills, 300 to 1500 ft.: Santa Cruz Mts. to w. Alameda Co. and Sonoma Co.; Calaveras Co. to Fresno Co. May-July.

788. Phacelia breweri Gray; *a*, fl. branchlet x 1; *b*, leaf x 1; *c*, long. sect. of fl. x 3; *d*, long. sect. of ovary x 6.

10. **P. brèweri** Gray. Fig. 788. Stem diffusely branching from the base, 4 to 9 in. high, the branches slender and with rather long internodes; herbage puberulent and hispidulose; leaves oblong-lanceolate, entire, cleft towards the base, or the lowermost and basal pinnately divided; racemes slender, lax or sometimes dense, 1 to 3 in. long, often geminate at the ends of the branches; sepals linear; corolla blue or whitish, 2 to 2½ lines long; scales narrow-oblong, acute at apex, attached the whole length; filaments glabrous, not exserted; capsule ovate, mostly 1-seeded.—Dry slopes, 2000 to 4000 ft., South Coast Ranges: Mt. Diablo; Mt. Day; Cedar Mt.; Mt. Hamilton; Santa Cruz Mts.; Santa Lucia Mts.; San Carlos Range. May-July.

11. **P. eisènii** Bdg. Stems slender, branched from base, erect or diffuse, 1½ to 7 in. high; herbage short-hirsute and somewhat glandular; leaves elliptic-oblong, entire or few-lobed, 6 to 8 lines long, narrowed to a petiole half as long; racemes loose, hardly scorpioid, the flowers on slender spreading pedicels; calyx-lobes narrowly spatulate, moderately unequal, 1 to 1½ lines long; corolla blue or white, 1¼ to 1½ times as long as the calyx; the nearly parallel lobes surpassing the anthers, the scales short, wholly adnate and united at base in front of the filament; capsule ovate, shorter than the calyx; seeds scrobiculate.—Montane, 4100 to 8000 ft., Sierra Nevada from Mariposa Co. to Tulare Co. May-July.

12. **P. marcéscens** Eastw. Stems erect, branching, 8 to 9 in. high; herbage and inflorescence glandular, puberulent; leaves ovate-lanceolate, coarsely dentate or pinnatifid, the upper entire; racemes rather dense; corolla blue, 2 lines long, only gradually or slowly pushed off by the enlarging capsule; scales long and very narrow, adnate; style cleft ⅔ or ¾.—Nevada Co. (Bear Valley, 3500 ft.); not otherwise known.

13. **P. hùmilis** T. & G. Fig. 789. Stem 1 or several from the base, 2½ to 5 (or 8) in. high, the racemes borne terminally on short axillary branchlets along the leafy axis from the base to the summit, sometimes not exceeding the subtending leaves, sometimes much elongated; herbage glandular-puberulent; leaves lanceolate, entire, 1 to 1½ in. long, shortly petioled, or the very lowest ovate and half as long; sepals linear to narrowly spatulate, hispid, ½ to ¾ as long as corolla; corolla campanulate, pale lavender or pale purple with a white center, 1½ to 2½ lines long; scales narrow, adnate, the free edge of adjoining pairs connivent; stamens slightly exserted; style deeply parted, sparingly glandular-puberulent; capsule 4 (rarely 6)-seeded, the seeds

789. Phacelia humilis T. & G.; *a*, habit x ½; *b*, fl. x 2½; *c*, corolla spread open x 2½; *d*, corolla scales x 5; *e*, cross sect. of ovary x 5.

regularly foveolate.—Granite sand of talus or rocky slopes, 4000 to 8300 ft.: San Bernardino Mts.; San Gabriel Mts.; Tehachapi Mts.; Sierra Nevada from Tulare Co. to Lassen Co.; n. Nev. to e. Ore. May-July. (P. congdonii Greene.)

14. **P. irrìtans** Brand. Stem branching from near the base, 4 to 6 in. high, the branches widely spreading or ascending; herbage hispid; leaves oblong-ovate, entire, ¾ to 1¼ in. long, narrowed at base to a short petiole; racemes rather dense, ¾ to 1½ in. long; corolla pale blue, campanulate, cleft nearly to middle, 2 lines long; scales semi-lanceolate, wholly adnate, the free edges of contiguous pairs partly connivent; stamens exserted, the filaments a little hairy.—N. Sierra Nevada, 5000 to 6100 ft., from Sierra Co. to Plumas and Lassen Cos.

15. **P. racemòsa** (Kell.) Bdg. Stem slender, 1½ to 4 in. high, simple below, commonly with opposite branches above, the successive pairs spreading at right angles with each other; herbage glandular-puberulent, the stems mostly glabrous and glaucous; leaves narrowly lanceolate, entire, tapering at base, ½ to 1½ in. long, shortly petioled or subsessile, equaling or surpassing the loose spikes or branches of the cyme; sepals linear-spatulate, shorter than the corolla; corolla dull white or blue, narrow-campanulate, 1 to 2 lines long; scales linear or oblong; stamens included, glabrous; capsule globose, shorter than the calyx.—Montane, 5300 to 7500 ft.: Sierra Nevada from Fresno Co. to Tehama Co., thence to Siskiyou and Trinity Cos. June-July. (P. namatoides Gray.)

16. **P. platýloba** Gray. Stem very slender, erect, sparingly branched, sparsely leafy, 1 to 2 ft. high; herbage minutely pubescent or the inflorescence somewhat hirsute; leaves pinnately divided (at least below apex) into distinct divisions or leaflets; leaflets discrete or remote, oblong to linear in outline, 3 to 6 lines long, pinnately parted or minutely pinnatifid into small (½ to 1½ lines long) entire or toothed segments; upper leaves less divided; racemes dense and loose, terminal and axillary; pedicels shorter than the calyx; sepals about 2 lines long, unequal, foliaceous, 3 linear-lanceolate and entire, 2 broadly ovate, contracted into a petiole-like base and crenately toothed, lobed or entire; corolla lavender, open-campanulate, 2 to 2½ lines long, lobed to about the middle; scales oblong, subcordate above; stamens slightly exserted; anthers purple; style twice as long as the corolla, deeply parted; capsule glabrous, acute at apex, shorter than the calyx.—Foothills, 1000 to 2000 ft., Mariposa Co. to Fresno Co. Apr.-May.

17. **P. tanacètifòlia** Benth. FIDDLE-NECK. Fig. 790. Stem stout, erect, sparingly branched, 1¼ to 4 ft. high; leaves pinnately divided, the leaf-

790. Phacelia tanacetifolia Benth.; fl. x 5.

lets pinnatifid, 2 to 7 lines long; racemes 3 to 4 in. long, ascending and approximate; sepals linear, beset with rigid bristles, in fruit little exceeding the oval capsule; corolla lavender or bluish, open-campanulate, 3 to 4 lines long, its scales entirely adnate; stamens much exserted.—Valleys and foothills, 100 to 1500 ft.: Great Valley; Sierra Nevada foothills; sporadic and in some localities perhaps introduced in the Coast Ranges, Mohave Desert and coastal S. Cal. Apr.-June.

18. **P. dístans** Benth. Stem erect and strict, or branching and diffuse, 8 to 23 in. high; herbage with scattered hispid hairs and close fine pubescence; leaves pinnately divided, the divisions commonly linear or oblong, once or twice pinnately and (for the most part) finely dissected; spikes scattered, solitary or geminate; sepals unequal, narrowly obovate to spatulate, rarely linear; corolla 3 to 4 lines long, rotate-campanulate, sordid white, blue, or violet, its scales semi-ovate, very undulate, with free tips; stamens little or not at all surpassing the corolla-lobes; capsule globose.—Foothills and mesas, loamy or sandy soil, 500 to 4000 ft.: Tehama and Napa Cos. to San Diego Co., e. to the s. Sierra Nevada in Tulare and Kern Cos.; Panamint Range; Nev. to Ariz.

19. **P. ramosíssima** Dougl. Stems several from the root-crown, simple or branching above, somewhat diffuse, 1½ to 3¼ ft. long; herbage somewhat glandular, hispid throughout and soft-pubescent (or only the leaves soft-pubescent); leaves pinnately divided into 5 to 9 oblong and serrate or incised divisions or leaflets, the lower distinct, the upper more or less confluent; stamens and style somewhat exserted; corolla sordid- or yellowish-white or bluish; calyx-lobes linear-spatulate to obovate, twice the length of the capsule or longer; seeds oblong, 1 line.—Foothill and mountain slopes and cañons, 200 to 9000 ft.: almost throughout Cal.; n. to Wash., s. to L. Cal. May-July. Var. SUFFRUTÉSCENS Parry. Stems glandular-hirsute or hispid; sepals oblanceolate, abruptly narrowed to a claw-like base, mostly distant. —Foothills, San Bernardino and San Gabriel mountains to Tejon Pass. Var. SUBSINUÀTA Mcbr. Stems hispid pubescent; sepals as in preceding var.—Near the coast, Monterey Co. to San Diego Co. (P. subsinuata Greene.) Var. CINÈREA Jepson n. comb. Herbage ashy, pubescent (ex char.).—San Nicolas Isl. (P. cinerea Eastw.)

20. **P. híspida** Gray. CATERPILLAR PHACELIA. Stems diffusely branched or erect and subsimple, ¾ to 2 ft. high; herbage with long slender spreading white bristles; leaves divided, the leaflets mostly distinct, discrete and deeply incised, 6 to 9 lines long, or the uppermost leaves merely laciniate-incised; racemes in age not dense; sepals oblanceolate, very narrow, slender-attenuate downward, densely set with long spreading white bristles; corolla pale blue or lavender, campanulate, 3 to 4½ lines long, 1½ to 2 times as long as the calyx; scales undulate or ruffled below, acutely narrowed upward and wholly adnate; stamens well or scarcely exserted; fruiting sepals 1½ to 2 times as long as the globose capsule.—Foothills, 1000 to 5700 ft.: Santa Lucia Mts. to San Diego; San Joaquin Valley; Sierra Nevada foothills from Butte Co. to Kern Co.; Tehachapi Range; Inyo Co.; Mohave Desert; w. side Colorado Desert. May-Aug. Var. CICUTÀRIA Mcbr. Racemes rather dense; stamens included.—Sierra Nevada foothills to S. Cal. Var. HÚBBYI Mcbr. Racemes very dense, commonly erect and often approximate; racemes and calyces shaggy-hirsute.—Mts. of Ventura Co.; San Gabriel Mts.

21. **P. erèmica** Jepson n. sp. Stems branching from the base, diffuse, 6 to 9 in. long; pubescent, with short spreading glandular hairs; leaves pinnately divided, the divisions or leaflets discrete, mostly toothed, scarcely incised, 3 to 5 lines long; racemes short, the flowers not crowded; sepals narrow, oblanceolate, slender or filiform (at base), conspicuously pilose; corolla blue, its throat irregularly translucent, 2½ to 3 lines long, little longer than calyx; scales narrow, adnate except at apex, terminating in a short bristle-like tooth which projects behind the filament, its tip approximating the tooth of the scale of the adjacent pair.—Rocky cañon walls, w. side Colorado Desert (Collins Valley, Jepson 8852, type).

791. Phacelia ciliata Benth.; *a*, habit x 1½; *b*, stamen and scales x 2; *c*, cross sect. ovary x 4.

22. **P. ciliàta** Benth. Fig. 791. Stem branched from the base with rather simple ascending branches, 9 to 14 in. high; herbage scabrous - pubescent; leaves pinnately divided, the divisions oblong, toothed or incised; spikes in terminal clusters or geminate or solitary; sepals ½ to ¾ as long as corolla; corolla blue, deeply bowl-shaped, 2½ to 3½ lines long; scales sub-orbicular, spreading horizontally, partly free; capsule ovate, mucronate; sepals in fruit twice as long as in flower, oblong-ovate to broadly ovate, chartaceous with thickened margins and prominent midrib, markedly venulose, sparsely bristly-ciliate, 3 to 5 lines long, arched over the capsule, their tips meeting.—Valley fields and montane flats, 20 to 5000 ft.: Coast Ranges from Humboldt Co. to San Benito Co. and Mt. Pinos; Tehachapi Mts.; w. side the Great Valley; n. L. Cal. Apr.-May. Var. THERMÀLIS Jepson n. comb. Low, 3 to 6 in. high; herbage strigose-pubescent or sometimes bristly; sepals oblong-ovate or lanceolate, ⅘ as long as in fruit, much enlarged, 4 to 5 lines long, decidedly bristly-ciliate.—About warm springs, Shasta and Modoc Cos.; n. to southern Ore. June. (P. thermalis Greene.)

23. **P. pédicellàta** Gray. Stem robust, erect, openly branched, 6 to 13 in. high; herbage short-villous and glandular; leaves broadly ovate or sub-orbicular in outline, 2½ to 4½ in. long, pinnately divided (at least below the apex) into 3 to 7 distinct leaflets with petiolules; leaflets sub-orbicular to ovate, serrate or incisely lobed, ½ to 2 in. long; upper leaves often round-ovate and merely deeply toothed; racemes short, dense, in terminal clusters; pedicels filiform, nearly as long as the flowers, often deflexed in fruit; sepals linear or oblanceolate, 2 to 3 lines long, exceeding the globular capsule; corolla white, open-campanulate, 3 lines long; scales short, rounded; stamens and style exserted, style 2-cleft.—Desert valleys and cañons, 500 to 4000 ft.: Funeral Mts.; Panamint Mts.; Providence Mts.; Colorado Desert; s. to L. Cal. Apr.-May.

24. **P. cryptántha** Greene. Stem 12 in. high, branched from the base; herbage thinly covered with spreading bristles; leaves pinnately divided into 5 to 7 divisions or leaflets, these obovate or elliptic, 4 to 9 lines long, the lower ones discrete and distinctly petiolulate; upper leaves 3-lobed or divided; racemes 3 to 4 in. long in fruit, not very dense; sepals oblanceolate or spatulate, rather densely set with long white spreading bristles, 4 to 5 lines long in fruit; corolla white, tubular-campanulate, 2 lines long, shorter than, or not exceeding, the calyx; scales broadly semi-ovate, wholly adnate, a little crosulate or slightly toothed; stamens included; seeds roughly favose; capsule globose, the fruiting sepals 3 times as long.—Cañons and washes, arid mountain ranges, 4000 ft.: Panamint Range; e. slope Sierra Nevada in Inyo Co.; Tehipite Valley. (P. hispida var. brachyantha Cov.)

25. **P. crenulàta** Torr. Stem erect, branching, 6 to 12 (sometimes 18) in. high; herbage hispid-pubescent, glandular throughout and ill-scented; leaves elliptic-oblong to linear-oblong, undulately or crenately lobed or pinnately divided with oblong or elliptic incisely toothed segments, 1 to 3½ in. long, the lower ones petioled, the upper usually sessile; racemes dense, in terminal clusters; pedicels very short; sepals oblong, obtuse, 2 lines long; corolla deep violet or purple-blue, rotate-campanulate, 3 to 5 lines long, the lobes crenulate; scales broadly lobed below, narrowed to an acute tip, wholly adnate; stamens and deeply cleft style long-exserted; filaments naked.—Desert val-

leys and mesas, 300 to 4700 ft.: Colorado Desert; e. Mohave Desert; Inyo Co.; e. to Nev., Col. and Ariz., s. to L. Cal. May-July.

26. **P. malvaefòlia** Cham. STINGING PHACELIA. Stem erect, freely branching or subsimple, ½ to 2½ ft. high; herbage hispid-bristly throughout, the bristles with a conspicuous pustulate base; leaves round-ovate to elliptic-ovate, truncate or cordate at base, shallowly lobed (the lobes serrate), 1 to 3 in. long, the petioles ⅕ to ½ as long; spikes solitary or geminate; corolla white, 2 to 2½ lines long, longer than the unequal spatulate sepals; scales semi-ovate, the apical point free; stamens exserted; capsule 2 to 4-seeded; seeds pitted.—Along the coast, especially on ocean bluffs, 10 to 200 ft.: Monterey Co. to Humboldt Co.; n. to southwest Ore. May-Aug. Var. LOÀSAEFÒLIA Brand. Lower leaves pinnately divided, the leaflets discrete; capsule 3 to 6-seeded.—Coast of Monterey and San Luis Obispo Cos., and e. to Nacimiento River. (P. loasaefolia Gray.)

27. **P. rattánii** Gray. Similar to P. malvaefolia but smaller throughout; spikes slender, ½ to 2 in. long; four sepals spatulate, the fifth obovate and longer; corolla white, 2 lines long; stamens included; filaments hairy.—Bushy hillsides, 1500 to 2000 ft.: Santa Cruz Mts.; Lake Co. to Shasta and Siskiyou Cos.; n. to southern Ore. June.

IV.—Subgenus EUTOCA. Scales of the corolla in some species free from the stamens, in others aduate to them; ovules more than 2 to each placenta; capsule with few to many seeds, these not transversely corrugated.

28. **P. perityloìdes** Cov. Stems several from a branched root-crown, freely and often densely branching, 3 to 9 in. high; main stems white-lanate with a dense covering of short spreading hairs; branchlets and foliage densely pubescent and glandular; leaves orbicular, cordate or truncate at base, dentate, 3 to 6 (or 11) lines long, mostly shorter than the slender petioles; racemes short, rather few-flowered; sepals spatulate, in fruit slightly exceeding the capsule; corolla white with purple tube, 4 lines long, twice as long as the calyx; scales narrowly linear; stamens not exserted; ovules 25 to each placenta.—Desert cañons, 3000 to 4500 ft.; Panamint Mts. May. Odor semi-mephitic and very disagreeable.

29. **P. hydrophýlloides** Torr. Fig. 792. Stems simple or branched, 4 to 10 in. high, arising on slender subterranean shoots from the crown of a very thick root; herbage puberulent and hispid except the leaves, these silky-pubescent on both sides; leaves broadly ovate to oblong-ovate, incisely few-toothed or lobed (especially towards base), 1 to 2½ in. long, sometimes with 1 or 2 supplementary leaflets near summit of the long petioles; spikes or racemes of the congested or capitate cyme short, not elongating; sepals narrow-linear or linear-spatulate; corolla violet-blue or whitish, its spreading lobes rolled under from each side so that they become pointed, the corolla-limb thus a little star-shaped; scales semi-oval or broadly linear, wholly adnate, the free edge undulate, the pair united below with base of filament; stamens and style strongly exserted; the style 2-parted below or to the middle; seeds 3 to 8, angled.—Dry sandy or gravelly soil, high montane, 5000 to 9000 ft.: Sierra Nevada from Tulare Co. to Lassen Peak. June-Aug.

792. Phacelia hydrophylloides Torr.; *a*, fl. branch x ½; *b*, flower x 2; *c*, sect. of corolla showing 2 stamens and scales x 2.

30. **P. procèra** Gray. Stems usually in clusters from a heavy root, very stout, erect, simple, leafy to the inflorescence, 3 to 7 ft. high; herbage minutely puberulent, the summit of the stem and the inflorescence glandular; leaves ovate to ovate-lanceolate, laciniate-pinnatifid into coarse acute lobes or sometimes merely incised, 2½ to 4 in. long; spikes mostly geminate, disposed in a terminal rather dense panicle; sepals linear, acute, shorter than the mature capsule; corolla white or bluish, bowl-shaped, 2½ to 3 lines long with short obtuse revolute lobes; scales oblong, adnate, divergent, united over the base of the filament; stamens well-exserted; style deeply 2-cleft; seeds 10 to 18, wing-angled.—Mountain meadows, 5000 to 6300 ft.: Nevada Co. to Lassen and Tehama Cos.; Humboldt Co. to Trinity and Siskiyou Cos.; n. to Wash. and Ida. July.

31. **P. bolánderi** Gray. Stem stout, simple or sparingly branched, ½ to 2 ft. high; leaves broadly ovate to oblong, coarsely serrate or incised, 2 to 3¾ in. long, the lower commonly with 1 or 2 pairs of small leaflets towards summit of petiole; inflorescence terminal, the racemes in pairs and somewhat corymbosely or at length racemosely disposed; corolla nearly rotate, violet, very pale blue or white, ½ to 1 in. wide; scales narrow, attached throughout; stamens somewhat exserted, sparingly pilose; style cleft to middle or below.—Rocky soil or on cliffs along the coast from Sonoma Co. to Del Norte Co.: Gualala; Navarro River; Cottonaby; Kenny to Usal; Camp Grant; Idlewild; Stitz Creek; between Bluff Creek and Orleans. The herbage has a disagreeable odor; it stains paper brownish in drying.

32. **P. lỳoni** Gray. Stem robust, erect, branching, 1 to 2 ft. high; herbage dark glandular-pubescent and somewhat hispid, heavy-scented; leaves large (broadly ovate in outline, 3 to 4 in. long), bipinnately divided into ovate crenate divisions 2 to 4 lines long; racemes dense, 1 to 1¼ in. long, compacted into a dense terminal cymose panicle; sepals linear-spatulate, nearly equaled by the capsule; corolla light blue, broadly campanulate, 2 to 3 lines long; scales semi-oval, united at base to the filament; stamens not exserted; capsule narrowly oblong, many-seeded; seeds oval, scrobiculate.—Santa Catalina Isl. May-June.

793. Phacelia douglasii Torr.; *a*, habit x 1; *b*, stamen x 5; *c*, cross-sect. ovary x 6.

33. **P. douglásii** (Benth.) Torr. Fig. 793. Stems several from the base, mostly simple, ascending or decumbent, 3 to 9 in. long; herbage puberulent and short, hirsute with mostly spreading hairs; leaves elongated-oblong or linear in outline, pinnatifid or pinnately parted, the lobes often unequal, entire or few-toothed; flowers loosely racemose; pedicels slender, frequently longer than the flowers, commonly more or less curved or retrocurved, 2 to 6 lines long; sepals spatulate, 1 to 3 lines long; corolla light-blue, open-campanulate, 3 to 6 lines long; scales semi-ovate or semi-lanceolate, wholly adnate; style 2-cleft at apex, hairy below; ovules 12 to 24 to each dilated placenta; capsule ovate, mucronate; seeds scrobiculate.—Sandy valleys, 20 to 2000 ft.: San Bernardino Valley and Los Angeles; n. to the upper San Joaquin Valley and to Contra Costa and San Francisco Cos. The habit and aspect are suggestive of Nemophila menziesii. Var. CRYPTÁNTHA Brand. Corolla small, scarcely longer than the calyx.—Flood-beds of rivers: w. San Diego Co.; L. Cal. Var. PETRÓPHILA Jepson n. var. Leaves entire, or some with 1, rarely 2, coarse teeth on each side below middle; corolla pale lavender, broad-campanulate, 3 lines long, its

scales almost obsolete; style very shortly cleft.—Surface of rock masses, Corral Hollow, Mt. Hamilton Range, 600 ft. (Jepson 9583, type).

34. **P. davidsònii** Gray. Habit of no. 33 and seemingly too close to it; leaves oblong-lanceolate to lanceolate, entire, coarsely few-toothed, rarely pinnatifid, ½ to 1½ in. long, drawn down to a rather long petiole; corolla purple or violet with yellowish-white tube, broad-campanulate, 3 to 5 lines long, 5 to 6 lines broad; tube often bearing 3 linear translucent spots between each set of scales.—Pine belt, 5000 to 7500 ft.: San Gabriel and San Bernardino mountains; Tehachapi Range; Greenhorn Range; e. side Sierra Nevada. (P. curvipes var. pratensis Brand.) Var. MACRÁNTHA Parish. Leaves deeply pinnatifid; flowers somewhat larger.—San Bernardino and San Gabriel mountains.

35. **P. rotúndifòlia** Torr. Stem commonly much-branched from base, 3 to 8 in. high; herbage hispid-pubescent, dark glandular; leaves cordate-ovate or cordate-orbicular, coarsely crenate, 5 to 8 lines long, on petioles often twice as long; racemes short, lax, rather few-flowered; sepals spatulate to linear-spatulate, exceeding the mature capsule; corolla tubular, white, 1½ to 2 lines long; scales reduced to linear thickenings; stamens not exserted; style slightly bifid at the apex; ovules 20 to 30 to each placenta; seeds globular.—Shady spots amongst rocks or cliffs, desert cañons: Ord Mts.; Providence Mts.; Panamint Mts.; e. to Utah.

36. **P. cùrvipes** Torr. Stems few to many from the base, diffuse or ascending, 1 to 3 (or 6) in. high; herbage pubescent; leaves oblong-ovate or -obovate to oblong or linear-lanceolate, entire, 3 to 9 lines long, rather long-petioled; racemes simple, rather lax; pedicels 1 to 2 lines long, curved or retrocurved in age; sepals ligulate-spatulate; corolla blue (sometimes white), campanulate, 2 to 3 lines long; stamens half as long as the corolla; scales narrow; style cleft ⅓ or ½; capsule ovate, acuminate, erect upon the spreading or deflexed pedicel; seeds 16, irregularly pitted.—Mountain slopes bordering the deserts, 4000 to 8000 ft., often under pines: Laguna Mts.; Santa Rosa Mts.; San Jacinto Mts.; e. side Sierra Nevada from Inyo Co. to Washoe Co., Nev.

37. **P. lineàris** (Pursh) Holz. Stems rigid, simple or racemosely branched, ½ to 1 or 1½ ft. high; herbage hirsute and minutely pubescent; leaves linear-lanceolate, entire, rarely 2-toothed, or sometimes a few of them deeply 3-cleft into linear entire lobes, ½ to 1½ in. long, mostly sessile; spikes or spike-like racemes disposed in a virgate or thyrsoid panicle; sepals narrowly linear or spatulate-linear, exceeding the capsule; corolla violet or sometimes white, 3 to 5 lines long; scales long and narrow, free from the filaments; stamens little or not at all exserted, the filaments sparsely hairy near the middle; ovules 12 to 16; seeds oblong, coarsely reticulate.—Montane, 2000 to 4000 ft.: Sierra Co. to Modoc Co., thence w. to Siskiyou and Trinity Cos.; n. to B. C., e. to Utah. June.

38. **P. mohavénsis** Gray. Stems slender, usually strictly branched at or above the base, sometimes diffuse, 2 to 7 (or 10) in. high; herbage hispid and glandular-pubescent; leaves oblanceolate or linear, entire or few-toothed, ½ to 1½ in. long; racemes strict, at length 1 to 2 in. long, the short pedicels erect; sepals spatulate or linear-spatulate, exceeding the capsule; corolla purple, campanulate, 2 to 3 lines long; scales narrow, adnate, widely divergent from base of filament; stamens slightly exserted, the filaments mostly glabrous; style cleft ⅔; ovules 4 or 5 to each placenta.—Ranges bordering the Mohave Desert, 4000 to 7000 ft.: San Gabriel and San Bernardino mountains; s. Sierra Nevada in Tulare Co. May-June.

39. **P. prínglei** Gray. Stems slender, simple or widely branched, 3 to 7 in. high; herbage finely glandular-puberulent or the stems glabrous and glaucous; leaves oblanceolate, entire, ¾ to 1½ in. long, at least the lower opposite; racemes axillary, few-flowered, loose; sepals linear, exceeding the capsule; corolla pale blue, 1½ to 2 lines long, the scales semi-lanceolate or very obscure; stamens not exserted, the filaments hairy at middle; ovules 2 or 3 (or 5) on each placenta.—Montane, 5000 to 8000 ft.: Eldorado Co. to Lassen Co. and Mt. Shasta. Sept. Very near P. racemosa Bdg. Var. ORÓGENES

Jepson n. comb. Herbage white-pilose, not glandular; corolla-tube white; stamens slightly exserted.--Mineral King, Tulare Co. (P. orogenes Brand.)

40. **P. divaricàta** (Benth.) Gray. Stem branched from the base, diffuse or spreading, the branches 3 to 16 in. long; herbage both pubescent and hirsute; leaves ovate to broadly oblong, 1 to 2 in. long, equaling or exceeding the petioles, entire, rarely with a pair of coarse teeth or with a pair of supplementary lobes at summit of the petiole; petioles equaling or exceeding the blade, or the cauline ones very short; pedicels about 1 line long; sepals in fruit linear, 4 to 7 lines long, sparsely hispid-ciliate, with somewhat thickened margins and prominent midnerve and cross-veins; corolla blue, broadly open-campanulate, 6 to 9 lines broad; style 2-cleft at apex; seeds 7 to 10, regularly pitted.—Open hills, 1000 to 2000 ft., Coast Ranges from Marin Co. to San Benito Co.: Mt. Tamalpais; Oakland Hills; Mt. Diablo; Mt. Hamilton; Santa Cruz Mts.; San Carlos Range. Mar.-June.

41. **P. parishii** Gray. Stems few to several from base, diffuse, 2 to 3 in. high, somewhat scape-like, the leaves mostly basal or sub-basal; herbage viscid-puberulent; leaves roundish-ovate or crenulate, 6 to 9 lines long, petioled; peduncles as long as the fruiting spikes; flowers crowded, the pedicels very short; sepals spatulate or obovate-spatulate, in fruit equaling the oblong capsule; corolla blue or bluish, 2 lines long, somewhat surpassing the calyx; scales obscure or none; stamens not exserted; style bifid at apex; seeds narrowly oblong, scrobiculate, ¾ line long.—Desert valleys, very rare: Rabbit Sprs., Mohave Desert. Steptos Valley, Nev. May-July.

42. **P. lemmònii** Gray. Stem more or less branched, 3 to 10 in. high; herbage minutely glandular-puberulent; leaves roundish-ovate or elliptic-ovate, angular-dentate or crenate, ½ to 1½ in. long, the petioles 3 to 8 lines long; spikes rather short-peduncled, rather loose in fruit; pedicels short, erect; calyx-lobes spatulate to linear-spatulate, in fruit a little longer than the ovoid capsule; corolla white, 2 to 3 lines long, hardly twice as long as the calyx; scales semi-oblong; stamens not exserted; seeds about 30, short-oval, ⅓ line long, minutely scrobiculate.—Moist spots, desert cañons, 4000 to 5000 ft., rare: Rock Creek, n. side San Gabriel Mts.; Argus Mts., Inyo Co.; e. to Ariz. May.

43. **P. suavèolens** Greene. Stem branched from the base, erect or ascending, 10 to 12 in. high; herbage pubescent and glandular, leaves obovate to oblong-elliptic, coarsely toothed (the teeth entire or sparsely denticulate), 1 to 2 in. long, on petioles ½ to ¾ as long; racemes solitary or in 2s, densely-flowered, often becoming 1½ to 2 in. long; pedicels very short (¼ or ⅓ line long); sepals obovate-spatulate, much longer than the capsule; corolla light blue, 4 lines long, nearly twice as long as the calyx; scales linear; stamens not exserted; style shortly bifid at apex; ovules 6 to each placenta.—Mountain slopes, Mt. Tamalpais to the Vaca Mts. Apr.-June.

44. **P. phacèlioìdes** (Benth.) Brand. Stem diffusely branching from the base, 5 to 8 in. high, puberulent and hispid; leaves elliptic to oblong-lanceolate, parallel-veined, entire, strigose-hispid, 1 to 1¾ in. long; flowers short-pedicelled or at first nearly sessile, in dense racemes or spikes; sepals in fruit linear-spatulate, hirsute or hispid with long spreading hairs, especially toward the base, 5 to 6 lines long, twice or thrice the length of the capsule; corolla dull white, narrowly funnelform, 2½ to 3 lines long; capsule ovate, acute or mucronate, 6 to 16-seeded; seeds scrobiculate.—Mountain peaks, 3500 to 4000 ft., central Coast Ranges, rare: Mt. Diablo, Mt. Hamilton. (P. circinatiformis Gray.)

45. **P. grísea** Gray. Stem diffusely branched, ½ to 1½ ft. high; herbage hirsute and finely pubescent, somewhat viscid; leaves ovate or oblong, entire or 1 or 2-toothed or incised, 1 to 2 in. long, tapering to a short petiole; spikes densely flowered, at length 2 to 4 in. long; calyx-lobes obovate-spatulate, little exceeding the capsule; corolla nearly white, 4 lines long; stamens and 2-cleft style conspicuously exserted; ovules 5 or 6 to each placenta.—Along the coast, Santa Lucia Mts. June.

46. **P. purpùsii** Bdg. Stem erect, simple or branched, 6 to 14 in. high; herbage hispid-pubescent, the stems and inflorescence glandular; leaves ovate

or oblong-lanceolate, obtuse or acutish, entire (rarely coarsely toothed), ¾ to 2 in. long, petioled; spikes many, racemosely disposed along the axis and terminal, densely many-flowered, at length 4 in. long; sepals spatulate, slightly exceeding the mature capsule; corolla pale or sordid blue, 3 to 4 lines long, the tube with lucid spots alternate with the scales; scales narrow or semi-oblong, one from each contiguous pair connivent by the free margins from top to bottom; stamens exserted; style parted below the middle; ovules 2 to 4 to each placenta.—Montane, 4000 to 6000 ft., Sierra Nevada from Mariposa Co. to Tulare Co.; rare. June-July.

47. **P. vallícola** Congdon. Similar to P. purpusii; stem simple or strictly branched, 6 to 12 in. high; herbage hispid, somewhat glandular, or the leaves silky; leaves ovate or oblong-elliptic, entire, ¾ to 1¼ in. long, on petioles ½ to nearly as long; racemes moderately densely flowered, becoming 2½ to 3 in. long; pedicels short; sepals spatulate or linear-spatulate, exceeding the capsule at maturity; corolla lavender, 2¼ lines long, a little longer than the calyx; scales narrowly linear; stamens not exserted; style short, parted a little below the middle; ovules 12 to 15 to each placenta; capsule globose-ovate, shortly subulate-beaked; seeds angular-oblong, reticulate.—Foothills, Mariposa Co. May.

V.—Subgenus Microgénetes. Corolla funnelform or cylindraceous, the scales vertical, long and narrow, often more or less united to the base of the filaments, or inconspicuous or absent; stamens unequal, included; style 2-cleft at apex; ovules several to each placenta; seeds oblong, with strong transverse corrugation.

48. **P. ivesiàna** Torr. Stems several to many from the base, diffuse or ascending, branching, 2 to 5 in. high; herbage thinly hirsute, pubescent and somewhat glandular throughout; leaves pinnately parted into several to many lobes, the lobes oblong-linear, usually entire or slightly toothed, 1 to 2 lines long; racemes few-flowered; sepals linear-spatulate, 2 lines long, the tips often recurved or spreading; corolla white or pale purple, nearly tubular, equaling or longer than the calyx, 2 to 3 lines long; scales mostly wanting or very small; stamens included; capsule glandular, conspicuously shorter than the calyx.—Desert flats, 200 to 2000 ft.: Colorado and Mohave deserts; Inyo Co.; n. to Ore., e. to Utah.

49. **P. affínis** Gray. Stems erect, usually several from the base, simple or sparingly branched, 3 to 12 in. high; leaves mostly basal or sub-basal, pinnately but irregularly parted into many lobes, the divisions or leaflets oblong, obtuse, few-toothed or entire, 1 to 2 lines long, often with small triangular lobes between; racemes densely flowered; sepals mostly straight (not recurving at tip), spatulate, somewhat glandular; corolla pale purple, oblong-campanulate, 1½ to 2½ lines long, about equaling the calyx; stamens included; scales narrowly linear, inconspicuous or obsolete; style slightly bifid at apex, shorter than the calyx; capsule nearly equaling the calyx; seeds reticulate but with conspicuous transverse corrugations.—Mountain slopes and cañons, 1000 to 3000 ft.: n. side San Gabriel Mts. (Arrastre Cañon); w. side Colorado Desert (Grapevine Spr. and Campo); s. to L. Cal. Mar.-May.

50. **P. bìcolor** Torr. Stems several from the base, diffuse or ascending, 4 to 7 in. high; herbage whitish-puberulent, glandular above; leaves pinnately divided into divisions, 1 to 2 (or 4) lines long, the divisions again finely pinnatifid; racemes not very densely flowered; sepals narrowly linear or a little spatulate; corolla violet or purple with white tube, narrowly funnelform, 6 to 8 lines long, 3 times as long as the calyx; scales narrow, adnate to corolla and united with the filaments almost their whole length thus forming a tubular pocket behind the stamen; style sharply cleft at apex; capsule oval-oblong.—Sandy valleys or flats, 2000 to 6000 ft.: ranges in or bordering the Mohave Desert; San Benito Co.; Inyo Co.; Lassen Co.; e. to Nev.

51. **P. fremóntii** Torr. Stems several to many from the base, diffuse or ascending, 6 to 12 in. high; herbage rather densely pubescent, the inflorescence and calyces glandular; leaves pinnately parted into many divisions or lobes, the lobes oblong or obovate, entire or usually so, 3 to 6 in. long, often

with smaller lobes between; basal leaves long-petioled, upper short-petioled or almost sessile; flowers crowded in elongated spike-like racemes; corolla lilac-blue or lavender, with yellow throat, broadly funnelform, 5 to 7 lines long, 2 times as long as the spatulate sepals; scales narrow, wholly adnate to corolla and free from the filaments or none.—Sandy soil, 2000 to 6800 ft.: mountain slopes bordering the Mohave Desert; upper San Joaquin Valley; South Fork Kern River; desert ranges of Inyo Co.; e. to Nev. and Ariz. Mar.-June.

52. **P. brachýloba** Gray. Stem erect, with many branches from the base or subsimple, 1 to 1½ ft. high; herbage densely short-hairy-pubescent and often glandular; leaves linear to oblong in outline, 1 to 2½ in. long, coarsely pinnatifid or pinnately parted, the lobes oblong, mostly obtuse, often somewhat dentate; racemes spicate, densely flowered, the flowers sessile; sepals linear-spatulate, 2 lines long; corolla white, or clear pink-lavender with yellow throat, campanulate, 3 lines long; throat bearing an oblong-ovate areola behind each stamen and a pair of smaller ones between each of these; scales of corolla usually absent; stamens included; filaments dilated at base; capsule oblong, shorter than the calyx; seeds inconspicuously corrugated.—Mountain slopes, moist sandy soil, 1500 to 5000 ft.: Cuyama, Santa Inez, San Gabriel and San Bernardino mountains to San Diego Co.

53. **P. hàllii** Brand. Stems several from the base, simple or branching, erect or decumbent, ascending, 5 to 12 in. high; herbage minutely puberulent, the inflorescence glandular; leaves pinnately divided, the segments oblong or linear, entire or few-toothed, 1 to 4 lines long; foliage more or less distinctly brown in color; racemes rather dense, 1 to 3 in. long; sepals linear-lanceolate; corolla bluish-purple, tubular, 4 lines long; stamens unequal, included; scales adnate to corolla, free from filaments, much reduced or often wanting; style hairy below, 2-cleft at apex; capsule oblong, 2 lines long.—Desert valleys or flats, 2000 to 7000 ft.: Mohave Desert and its bordering ranges; n. to Inyo Co.

54. **P. pachyphýlla** Gray. Stem compactly branched forming a low dwarf 1½ to 2½ (or 4) in. high; herbage viscid or glandular-pubescent throughout; leaves roundish to ovate, obtuse, subcordate at base, entire or crenate, 5 to 12 lines long, the petioles often as long or longer; racemes short, in flower not exceeding the leaves; sepals glandular, oblong-spatulate, 1½ to 2 lines long; corolla purple, narrowly campanulate, 2 to 3 lines long; stamens included; scales narrowly linear.—Alkaline soil or gravelly benches in the deserts, 200 to 2000 ft.: e. Mohave Desert; Colorado Desert; s. to L. Cal., e. to Ariz.

55. **P. calthifòlia** Brand. Stem stout, erect, commonly branching from the base, 3½ to 11 in. high; herbage densely glandular-pubescent throughout, staining paper brownish in drying; leaves roundish and subcordate, crenate or crenulate, 1 to 2 in. long, the lower long-petioled, the upper almost sessile and nearly opposite, smaller; racemes densely flowered, 1½ to 6 in. long, the flowers almost sessile; sepals broadly linear, 2 to 3 lines long, very glandular; corolla purple, broadly campanulate, 4 to 6 lines long; scales semiobovate, rounded and free at apex, the sides adnate to corolla, the other edge attached to filament, so that the pair makes a pocket behind stamen; stamens unequal, included.—Desert washes, 100 to 2500 ft., e. Mohave Desert; Death Valley region.

6. MILTÍTZIA A. DC.

Annuals, similar to Phacelia. Pedicels commonly ⅕ to ½ as long as the flowers. Calyx-lobes in ours linear-oblanceolate. Corolla persistent, the scales in its tube very minute. Style in ours persistent. Capsule ovoid. (Frederich von Miltitz of Dresden, author of a handbook of botanical literature, 1829.)

Stems diffuse; corolla 1¼ to 1½ times as long as calyx.....1. *M. glandulifera.*
Stems erect; corolla slightly exceeding calyx.....2. *M. inyoensis.*

1. **M. glandulífera** (Torr.) Hel. Stems several from the base, branching, diffuse, 2½ to 6 in. long; herbage pubescent, the inflorescence usually slightly glandular; leaves broadly oblong or ovate, pinnatifid, 5 to 12 lines long;

flowers in short racemes, a little crowded; pedicels ½ as long as the calyx; corolla bright yellow, 3 lines long, 1¼ to 1½ times as long as the calyx.—Madeline plains, Lassen Co.; e. to Washoe Co., w. Nev. (Emmenanthe glandulifera Torr.)

2. **M. inyoénsis** Mcbr. Stems slender, erect; leaves oblong, incisely pinnatifid and dentate; racemes lax; corolla bright yellow (ex char.).—Foothills, w. Inyo Co.

7. EMMENÁNTHE Benth.

Annuals, similar to Phacelia. Flowers soon pendulous, borne on filiform pedicels about as long. Corolla cream-color or yellow, campanulate, persistent. Style deciduous. Capsule compressed. (Greek emmeno, to abide, and anthos, flower, the corolla not deciduous.)

1. **E. pénduliflòra** Benth. WHISPERING BELLS. Fig. 794. Stem erect, usually much branched from the base, 8 to 21 in. high; herbage villous-pubescent and somewhat viscid; lobes of the pinnatifid leaves numerous, short, toothed or incised; racemes loose, straight, ascending, paniculed at summit of the stem; corolla 4 to 5 lines long, the glabrous filaments adnate to the very base; ovary short-bristly and stipitate-glandular; placentae conspicuously dilated in the axis; seeds conspicuously pitted in somewhat regular lines.—Open or chaparral slopes, 200 to 5200 ft.: Coast Ranges from Glenn Co. to San Luis Obispo Co.; Sierra Nevada (Amador Co. to Mariposa Co.; Kern Co.); Tehachapi Mts.; coastal S. Cal.; Mohave and Colorado deserts; L. Cal.; Ariz. to Nev. and Utah. June-July.

794. Emmenanthe penduliflora Benth.; *a*, fl. branchlet; *b*, leaf. x 1.

8. LEMMÒNIA Gray

Small depressed annual with repeatedly dichotomous stems and alternate leaves. Flowers small, sessile, solitary in the lower forks, cymose-glomerate at the ends of the branches. Corolla narrowly bowl-shaped, without appendages. Stamens short, included, abruptly dilated at base, the dilations joined by a very much reduced or lineate wing or margin. Ovary 2-celled, each cell 2 or 3-ovuled. Styles 2, distinct to the base, short. Capsule membranous, 2-valved. Seeds 4, roughly pitted. (J. G. Lemmon, a pioneer botanical explorer of California.)

1. **L. califórnica** Gray. Plants prostrate or diffuse, 3 to 9 in. broad; herbage puberulent; leaves rosulate at base, solitary in the forks and crowded at the ends of the branches, spatulate, tapering into a short petiole, entire, 3 to 7 lines long; sepals narrowly linear, densely white-hairy, in fruit twice the length of the capsule; corolla white, 5-lobed, 1¼ lines long, not exceeding the sepals; ovary densely hairy at summit; capsule 1 line long.—Mts. bordering the Mohave Desert on the sw. and n.: Cajon Pass; Arrastre Creek; Mt. Pinos; Tehachapi Mts.; s. Sierra Nevada in Kern Co.; also Mt. Hanna, Lake Co.

9. NÀMA L.

Herbs. Flowers purple, bluish or white. Calyx deeply 4 or 5-parted. Corolla funnelform, the tube without appendages. Stamens included, commonly unequal and often unequally inserted on the lower part of the corolla-tube. Styles 2, distinct or united except at apex. Capsules thin-walled, 2-celled (the 2 thin placentae meeting in the axis) or incompletely 2-celled (the placentae only approximate), finally dehiscing into 2 entire valves. Ovules 6 to 60 to each placenta, seeds usually as many. (Greek nama, a spring.)

A. ANNUALS; LOW PLANTS OF ONE ASPECT; LEAVES ENTIRE.

Styles more or less connate.
Ovary superior; leaves not clasping; sepals straight.—Subgenus CONANTHUS.
Corolla 4½ to 7½ lines long.....1. *N. aretioides.*
Corolla 2½ to 3 lines long.....2. *N. densum.*
Ovary half-inferior; upper leaves clasping; sepals linear, spatulate-dilated at tip, in fruit accrescent, spreading or recurved at tip, the midnerve strongly thickened.—Subgenus ZONOLACUS.....3. *N. stenocarpum.*
Styles distinct.—Subgenus NEONAMA.
Corolla campanulate, 4½ to 7 lines long, its limb rather broad.
Stems ascending; adnate portion of filaments not winged.....4. *N. hispidum.*
Stems prostrate; adnate portion of filaments with a narrow margin on each side.....5. *N. demissum.*
Corolla cylindric or salverform, 1 to 2½ lines long, its limb narrow.
Leaves obovate, abruptly attenuate into a petiole, the blade 1 to 2½ lines long..6. *N. pusillum.*
Leaves oblanceolate, gradually attenuate into a petiole, the blade about 2 to 5 lines long.....7. *N. depressum*

B. PERENNIALS; PLANTS VERY DIVERSE IN ASPECT.

Stems procumbent, woody at base; herbage silky-woolly; leaves entire, dimorphic; adnate portion of stamens not winged or scarcely so.—Subgenus LOBBIANA.....8. *N. lobbii.*
Stems erect; herbage hirsute or hispid; leaves of one kind, not entire; adnate portion of stamens narrowly winged on each side.
Stems low, herbaceous, from a deep-seated perennial root-crown; leaves sinuate-toothed or pinnatifid.—Subgenus ROTHROCKIA.....9. *N. rothrockii.*
Stems tall, woody at base; leaves revolute.—Subgenus TURRICULA.....10. *N. parryi.*

1. **N. arètioides** (H. & A.) Brand var. **multifìorum** Jepson n. comb. Stems 3 to 5 from the base, dichotomous, leafy below the terminal cymes, 1½ to 4½ in. long; cymes dense, very leafy; leaves narrow-oblanceolate, 6 to 8 lines long; fruiting sepals subulate, hirsute, 3½ lines long, about 2½ times as long as the capsule; corolla purple or rose-red, tubular-funnelform, 6 to 7½ lines long; capsule narrow-elliptic, 1¼ lines long, each placenta about 10-seeded.—Sandy washes or flats, 4000 to 5000 ft.: Inyo Co.; Bishop foothills; Argus Mts. (f. multiflora Brand.) Var. CALIFÓRNICUM Jepson n. comb. Corolla tubular, 4½ to 5 lines long.—Sierra Co. (f. californica Brand.)

2. **N. dénsum** Lem. Similar to no. 1; leaves and sepals white-hispid; leaves oblanceolate, acute, gradually narrowed to a petiole, ½ to 1 in. long; flowers in terminal clusters and solitary in the forks; corolla purple, cylindric, 3 lines long; seeds black, angular.—Plains or mountain slopes, 3000 to 8000 ft., e. and n. side of Sierra Nevada, rather rare: Inyo Co.; Plumas Co. to Modoc and Siskiyou Cos.; Nev. to Wash.

3. **N. stenocárpum** Gray. Stems many from the base, diffuse, 3 to 11 in. long, mostly very leafy; herbage hirsute; leaves oblanceolate to linear-oblong, ¾ to 2 in. long; flowers in terminal clusters; sepals 1½ times as long as the capsule; corolla tubular, 3 to 3½ lines long; capsule linear, 3 lines long.—Shores of lakes or ponds, S. Cal.: Santa Monica; Diamond Lake, Colorado Desert; Sweetwater Valley, San Diego Co.; s. to L. Cal. Mar.-May. (N. humifusum Brand.)

4. **N. hìspidum** Gray var. **còulteri** Brand. Stems few to many from the base, ascending, 4 to 7 in. long; herbage hispid; leaves narrow-oblanceolate, gradually narrowed to base, ½ to 1½ in. long; flowers in loose or somewhat dense terminal clusters; corolla purple, 4 to 6 lines long; style shorter than the calyx; ovules 20 to 50 to each placenta.—Sandy valleys or washes, Colorado Desert: Palo Verde; Chuckawalla Valley; Mecca; Calexico; Split Mt.; e. to N. Mex., s. to Mex. Var. REVOLÙTUM Jepson n. var. Leaves linear, the margin revolute, ½ to ¾ line wide.—Colorado River (Pilot Knob, J. Grinnell, type).

5. **N. demíssum** Gray. Stems prostrate or diffuse, spreading from a basal rosette, 1 to 6 in. long; herbage hirsutulose-pubescent; leaves linear-spatulate, gradually attenuate to a petiole, ½ to 1½ in. long; flowers in terminal clusters; sepals narrowly linear; corolla bright crimson-purple, 5 to 6 lines long; filaments unequal and unequally inserted, their adnate bases with somewhat free margin; capsule "10 to 16"-seeded; ovary a little hairy.—Desert plains and mesas, 3000 to 5000 ft.: Lassen Co.; Inyo Co.; Mohave and Colorado deserts (common); s. to L. Cal. Apr.-May.

6. **N. pusíllum** Lem. Stems 3 to 5 from the base, prostrate, dichotomously branching, ½ to 2¾ in. long, ending in cymose flower-clusters; herbage hirsute-pubescent; leaves broadly obovate, 1 to 2½ lines long, rather abruptly contracted into a petiole nearly as long; sepals linear, densely hirsute-ciliate; corolla white, cylindric with narrow limb, 1½ to 1¾ lines long; capsules elliptic, 1⅛ lines long.—Stony mesas: Inyo Co.; e. Mohave Desert; n. side Colorado Desert. May.

7. **N. depréssum** Lem. Stems 3 to 8, spreading from the basal rosette of leaves, decumbent or ascending, naked or nearly so below the leafy dichotomous cyme, 1 to 3½ in. long; herbage puberulent; leaves linear-oblanceolate, gradually attenuate into a petiole, the whole 4 to 10 lines long; sepals linear, thinly hirsute-ciliate; corolla white, cylindric with narrow border, 1½ to 2 lines long, its lobes crenulate, the lower one with 2 dots; capsules oblong, 1¼ to 1½ lines long, the cells 6 to 8-seeded.—Sandy flats or mesas: Mohave Desert; Inyo Co.; Kernville.

8. **N. lóbbii** Gray. Fig. 795. White-woolly plant with creeping or ascending woody stems ½ to 2 ft. long; leafy shoots of 2 kinds: vegetative shoots glandular and greenish, their leaves rather crowded, linear or narrow-oblanceolate, more or less revolute, ¾ to 1 in. long, with a short branchlet or dense fascicle of smaller leaves in the axils; flowering shoots arising terminally the next year from the vegetative branchlets, their leaves scattered, white-woolly, oblanceolate to spatulate, 1 to 2¼ in. long, and bearing sessile or shortly peduncled clusters of flowers in their uppermost axils, the two types of foliage shoots thus appearing in regular alternation; sepals narrowly linear, ¾ as long as corolla; corolla purple, narrow-funnelform, 4 lines long; ovary densely and style somewhat hairy.—Montane, in rocky or red soil, 4000 to 7000 ft.: n. Sierra Nevada from Placer Co. to Lassen Peak, thence to Siskiyou Co.; w. Nev.

795. Nama lobbii Gray; *a*, fl. branchlet x ⅔; *b*, fl. x 1⅔; *c*, long. sect. of fl. x 1⅔.

9. **N. rothróckii** Gray. Stems erect, simple, several from a deep-seated perennial root, 6 to 8 in. high; herbage glandular-pubescent, the stems, petioles and especially the calyx with spreading bristles; leaves narrowly oblong, regularly sinuate-dentate, 1 to 1⅝ in. long, sessile or nearly so; flowers numerous in a dense terminal head, the heads 1½ to 1¾ in. broad; sepals narrowly linear, 4 to 5 lines long, the lavender corolla 1 to 2 lines longer; ovary and lower part of styles hispidulous; seeds few, minutely reticulate-pitted.—Sandy meadows, 6500 to 10,000 ft., upper Kern River region from the South Fork to the Kern-Kaweah Falls.

10. **N. párryi** Gray. Stems coarse, several in a clump from a deep taproot, often slightly woody at base, 4 to 9 ft. high; herbage viscid-pubescent and ill-scented; leaves lanceolate, coarsely serrate to dentate or denticulate, acuminate, drawn down to a narrow base, 6 to 10 in. long; flowers in scorpioid spikes, the spikes in a virgate panicle 6 to 18 in. long; pedicels short (½ line); calyx glandular-hirsute, its tube shallow, its lobes linear-lanceolate, about ¼ length of corolla; corolla purple, pubescent outside, the middle lobe of lower lip smaller than the lateral, its tube 5-angled at base; stamens included, 3 long and 2 short; filaments almost wholly adnate, slightly hairy at their middle; base of style and summit of ovary hairy; style 2-cleft to

base.—Montane, 4000 to 6500 ft.: s. Sierra Nevada (Shadequarter Mt., Tulare Co.); San Emigdio, San Gabriel, San Bernardino, Santa Ana and San Jacinto mountains; Palomar Mt.; Cuyamaca Mts.; s. to L. Cal.

10. ÉRIODÍCTYON Benth.

Shrubs with aromatic herbage. Leaves alternate, pinnately veined, finely reticulated, coriaceous, dentate, and petiolate. Inflorescence a terminal, usually naked, panicle of scorpioid cymes. Sepals narrow, not dilated above. Corolla funnelform to campanulate, its tube without appendages. Filaments more or less adnate to the tube of the corolla, little or not at all exserted, sparsely hirsute. Ovary nearly or quite 2-celled by the meeting of the dilated placentae in the axis; styles 2, distinct. Capsule 2 lines long or less, first loculicidal, then septicidal, thus 4-valved, each valve with a short beak or acumination and closed on one side by the adherent dissepiment or half-partition. (Greek erion, wool, and diktuon, a net, by reason of the netted woolly under surface of the leaves.)

Leaves glutinous, nearly or quite glabrous above.
Calyx sparsely hirsute; corolla weakly puberulent outside; cent. and n. Cal..... 1. *E. californicum.*
Calyx densely white-silky; corolla densely hairy outside; mts. of S. Cal..... 2. *E. trichocalyx.*
Leaves densely tomentose on both surfaces.....3. *E. crassifolium.*

1. **E. califórnicum** (H. & A.) Greene. YERBA SANTA. MOUNTAIN BALM. Fig. 796. Shrub, 2 to 8 ft. high; leaves oblong to oblanceolate, tapering below and frequently above, dentate except at base or below the middle, very glutinous-resinous, as if varnished, the areas between the veins and cross-veinlets on the under surface with a close dense felt; calyx 1 line long with linear lobes; corolla white or pale blue, tubular-funnelform, 4 to 6 lines long; stamens and styles included. — Dry mountain slopes and ridges, 500 to 4000 ft., common and often abundant and gregarious over extensive areas: Coast Ranges from Monterey Co. to Siskiyou Co.; Sierra Nevada from Tulare Co. to Eldorado Co.; n. to southern Ore. May-June. (E. glutinosum Benth.)

796. Eriodictyon californicum Greene; *a*, fl. branchlet; *b*, leaf. x ⅔.

2. **E. trichòcalyx** Hel. Shrub, rather too close to no. 1; calyx densely white-hairy; corolla narrow-campanulate, 3 to 4½ lines long, densely pubescent outside. —Mesas and chaparral belt, 1200 to 5500 ft.: Santa Inez, San Gabriel and San Bernardino mountains. (E. angustifolium var. pubens Gray.) Var. LANÀTUM Jepson n. comb. Leaves very white-tomentose beneath. — Santa Rosa, Cuyamaca and Laguna mountains; s. to L. Cal. (E. californicum var. lanatum Brand.)

3. **E. crassifòlium** Benth. Shrub 4 to 6 (or 12) ft. high, leafy at the top; herbage densely tomentose, sometimes snow-white, sometimes dull or greenish; leaves oblong to oval, thick and rigid, crenate, 2 to 4 in. long; cyme 2 to 3 in. broad; calyx densely villous, half as long as the slightly villous corolla; corolla somewhat salverform, 4 to 6 lines long.—Mts., 2000 to 6000 ft., Ventura Co. to San Diego Co. Var. NÌVEUM Brand. Sepals white-silky, not glandular; corolla 2 to 2½ lines long, scarcely longer than the calyx, its lobes connivent in anthesis.—Santa Lucia Mts. of Monterey and San Luis Obispo Cos. (E. niveum Eastw.) Var.

TRÁSKIAE Brand. Similar to var. niveum; sepals black-glandular; corolla 2½ to 3 lines long.—Santa Inez Mts.; Santa Catalina Isl. (E. traskiae Eastw.)

11. TRICÁRDIA Torr.

Perennial herb, the leaves mostly in a basal rosette. Flowers purplish, rather few in loose spicate racemes. Sepals almost distinct, very dissimilar, the 3 outer large and cordate, becoming much enlarged, scarious and reticulate-veiny in fruit, the 2 inner linear. Corolla broad-campanulate, slightly contracted at the mouth, deciduous, the 10 narrow internal appendages free from the filaments. Stamens unequal, equally inserted on the lower part of the corolla-tube. Ovary 1-celled, glabrous; ovules 4 on each placenta; style 2-cleft. Capsule thin-walled, 1-celled. (Greek tri, three, and cardia, heart, referring to the 3 outer sepals.)

1. **T. watsònii** Torr. Stems ascending or erect, several from a short root, 5 to 11 in. high; leaves oblong-spatulate to oblong-linear, serrate, 1 to 2½ in. long; sepals 2 lines long, becoming ½ to 1 in. long in fruit; corolla purplish, 3 lines long.—Hillslopes or cañons, 1500 to 7000 ft.: Colorado and Mohave deserts; Inyo Co.; e. to southern Utah.

12. HÉSPEROCHÌRON Wats.

Dwarf perennial herbs. Flowers solitary on naked peduncles arising from a leaf-rosette on the ground. Leaves oblong, spatulate or ovatish, entire, ciliate, equaling or exceeding the peduncles. Calyx 5-parted, with linear-lanceolate lobes. Corolla purplish or nearly white, campanulate or rotate, deciduous, the stamens inserted on the base of its tube. Filaments subulate, more or less hairy at base. Ovary 1-celled; placentae narrow, projecting into the cavity, borne on narrow plates or half-partitions. Style 2-cleft at apex. (Greek hesperus, western, and Chiron, referring to the Centaur.)

Corolla oblong-campanulate, its lobes shorter than the tube.....1. *H. californicus.*
Corolla saucer-shaped, its lobes longer than the tube.....2. *H. pumilus.*

1. **H. califórnicus** (Benth.) Wats. Leaves many in a basal tuft, narrowed at base to a short petiole, 1 to 1½ in. long; herbage grayish-pubescent; corolla white with a flare of pinkish veins, a little hairy at base.—Mountain valleys and flats, 4000 to 8600 ft.: Sierra Nevada from Tulare Co. to Siskiyou Co.; e. to Utah, n. to Wash.

2. **H. pùmilus** (Dougl.) Porter. Leaves few in a basal tuft, oblong or ovatish, 1 to 1¾ in. long, the petioles ¼ to ½ as long; herbage greenish, the leaves subglabrous except on the margins; flowers 6 to 8 lines wide.—Moist flats or meadows in the mts.: Sierra Nevada from Fresno Co. to Plumas Co., 6000 to 8000 ft.; Lake Co., 1300 ft.

13. ROMANZÓFFIA Cham.

Low and delicate perennial herbs with the aspect of some species of Saxifraga. Stems somewhat scape-like, loosely racemose. Leaves mostly basal (the cauline alternate), round-cordate, crenately lobed, long-petioled. Flowers white. Calyx 5-parted into nearly distinct sepals. Corolla broadly funnelform, destitute of appendages, deciduous. Stamens unequal, inserted on the base of the corolla-tube. Style filiform, entire; stigma small. Capsule 2-celled or nearly so, with narrow placentae. Seeds numerous. (Count Romanzoff, promoter of the Russian voyage of Kotzebue; dedicated to him by Chamisso, the German poet and botanist, who accompanied the expedition.)

1. **R. sitchénsis** Bong. Stems slender, 4 to 9 in. high, arising from a filiform rootstock bearing tubers; pedicels spreading, much longer than the flowers; calyx-lobes linear or lanceolate, not more than ⅓ as long as the corolla and exceeded by the capsule.—On moist rocks in shady places near the coast: San Mateo Co. and Mt. Tamalpais to Humboldt Co.; n. to Alas. Rare within our limits.

BORAGINÀCEAE. Borage Family

Herbs, usually rough with coarse hairs. Leaves simple, commonly entire and alternate. Flowers complete, in one-sided spikes or racemes, coiled spirally (scorpioid) and uncoiling as flowering proceeds. Calyx with com-

monly 5 divisions or teeth. Corolla regular, 5-lobed, with 5 stamens inserted on its tube and alternating with its divisions. Ovary superior, deeply 4-lobed (except in Heliotropium), with a simple style inserted between the lobes, in fruit splitting into 4 one-seeded nutlets. Style entire or none, rarely 2-cleft. Nutlets commonly roughened or prickly. Endosperm none, except in Heliotropium. Ovary not deeply parted in Heliotropium, Euploca and Coldenia, or merely lobed or laterally grooved. Nutlets often inserted on a short thick prolongation of the receptacle known as the gynobase. The spikes or racemes (here so-called for convenience) are really one-sided scorpioid cymes. Euploca has 2 nutlets.

A. Ovary undivided or merely lobed, sometimes 2 to 4-grooved on the sides; style terminal.

Style entire, the style or stigmas provided with a glandular ring.
Flowers axillary (or appearing so) and solitary; fruit of 2 nutlets; stigma annular, surmounted by a tuft of short bristles; deserts.....1. EUPLOCA.
Flowers in dense scorpioid racemes; fruit of 4 nutlets; stigma peltate, not tufted (in ours); common.....2. HELIOTROPIUM.
Style 2-cleft, the stigmas capitate; herbs; deserts.....3. COLDENIA.

B. Ovary deeply 4-parted; style entire or none (or rarely barely 2-cleft at apex), arising from between the lobes of the ovary.

1. Nutlets armed with barbed prickles.

Nutlets globose or thick; flowers mostly blue, rarely white; plants mostly stout, tall (1 to 3 ft.).
Nutlets spreading, prickly all over; perennials.....4. CYNOGLOSSUM.
Nutlets erect, prickly on the margin and sometimes on the back; perennials or annuals. 5. LAPPULA.
Nutlets thin and flat, divergent or spreading in pairs; flowers white, low and slender; annuals.....6. PECTOCARYA.

2. Nutlets unarmed or merely tuberculate.

Calyx pubescent, hispidulose or glabrous, not armed with barbed prickles.
Receptacle flat or merely convex; perennials.
Flowers with tubular or tubular-funnelform corollas; corolla blue; nutlets wrinkled.....7. MERTENSIA.
Flowers with rotate or funnelform corollas; nutlets smooth and shining.
Throat of the corolla contracted by prominent crests; racemes mostly without bracts; corolla light-blue.....8. MYOSOTIS.
Throat of corolla naked or with low crests; racemes bracteate; corolla greenish-yellow.....9. LITHOSPERMUM.
Receptacle more or less elongated or produced upward into a structure (gynobase) to which the nutlets are attached.
Corolla bright or orange yellow, the throat open and naked.....10. AMSINCKIA.
Corolla white, or cream-color or pale yellow, the throat with more or less prominent bulbous swellings or crests.
Perennials; calyx persistent; mostly high montane.....11. OREOCARYA.
Annuals (except 2 species each in nos. 13 and 14); mostly low altitudes.
Calyx circumscissile.....12. GREENEOCHARIS.
Calyx not circumscissile (except two species in no. 16).
Nutlets erect, attached from the base to the middle by a groove or scar.
Calyx (and pedicels) usually falling away with the fruit; corolla-throat with crests; leaves commonly alternate.....13. CRYPTANTHA.
Calyx (and pedicels) persistent; corolla-throat with only obscure crests; lower leaves opposite..14. ALLOCARYA.
Nutlets oblique or incurved so that the apices are approximate in center, attached above the base to an elevated scar or caruncle.
Caruncle borne on a stipe-like base; lowest leaves opposite... 15. ECHIDIOCARYA.
Caruncle commonly borne in a hollow or transverse groove; leaves mostly in a basal rosette.16. PLAGIOBOTHRYS.
Calyx-lobes armed with barbed prickles, the calyx in fruit modified to form a bur-like envelope for the nutlets; annual.....17. HARPAGONELLA.

1. **EÙPLOCA** Nutt.

Small annuals. Flowers solitary. Corolla white, the upper part of the tube enlarged and the orifice narrowed, the limb scarcely lobed. Style elongated. Stigma annular, surmounted by a tuft of short bristles. Fruit globosely 2-lobed, each lobe splitting into 2 hemispherical one-seeded nutlets. (Greek eu, well, and ploke, a woven thing.)

1. **E. albiflòra** (Raf.) Jtn. Stem branched, 1 to 3 in. high; herbage, calyx, corolla-tube and midnerve of limb strigose-hispid; leaves ovate to oblong-lanceolate, 5 to 9 lines long, petioled; flowers shortly pediceled, "sweet-

scented''; corolla 5 lines broad.—Desert valleys, 200 to 1800 ft.: Ludlow, e. Mohave Desert; Palo Verde Valley; e. to Neb., s. to Mex. (E. convolvulacea Nutt.)

797. Heliotropium curassavicum L.; *a*, fl. branchlet x 1; *b*, corolla spread open x 5; *c*, pistil x 10.

2. **HELIOTRÒPIUM** L. Heliotrope

Herbs with alternate mostly entire leaves. Flowers white, in dense one-sided spikes. Calyx-segments lanceolate or linear. Corolla salverform, short, with open throat; sinuses more or less plaited in the bud. Stamens included; anthers acuminate, connivent, nearly sessile. Stigma annular or conic. Ovary not lobed, separating when ripe into 4 one-seeded closed nutlets. (Greek helios, sun, and trope, a turning, ''the flowers beginning to appear at the summer solstice.'')

1. **H. curassávicum** L. Chinese Pusley. Fig. 797. Stems branching, ½ to 3 ft. long, prostrate, from a perennial root; herbage glabrous, glaucous, fleshy; leaves obovate to broadly oblanceolate; spikes mostly in pairs; corolla white with the yellow eye changing to purple, 1½ to 2 lines long; stigma turned downward over summit of ovary and thus resembling a skull-cap; style none.—Common along the seashore, in stream beds, and in low moist or alkaline lands throughout Cal. June-Nov. Immigrating locally.

3. **COLDÈNIA** L.

Low prostrate or spreading plants, mostly suffrutescent, hoary-pubescent and often hispid, the small pale flowers sessile and usually clustered in the forks or at the ends of the branches and subtended by a tuft or circle of leaves. Leaves small, petioled, with veins usually conspicuous. Calyx 4 or 5-parted into slender segments. Corolla short-funnelform or nearly salverform, not more than twice as long as the calyx, the short lobes broad and rounded. Stamens included. Style 2-cleft or -parted. Ovary entire or 4-lobed, 4-celled. Fruit separating at maturity into 4 one-seeded nutlets, or by abortion fewer. (Dr. Cadwallader Colden, Colonial Lieutenant-Governor of New York, a correspondent of Linnaeus.)

Stems dichotomously branched; leaves conspicuously veined, the petioles often equaling or longer than the blade; corolla appendaged within.
Leaves ovate to rotund or rhombic, with 2 or 3 pairs of veins; herbage pubescent and somewhat hispid or hirsute.
Annual; leaf-margins revolute.....1. *C. nuttallii.*
Perennial; leaf-margins sinuate.....2. *C. brevicalyx.*
Leaves mostly obovate with 5 or 6 pairs of veins; perennial (apparently); herbage not hispid or hirsute.....3. *C. palmeri*
Stems diffusely branched; leaves obscurely veined, the blade longer than the petiole; corolla not appendaged within; perennial.....4. *C. canescens*

1. **C. nuttállii** Hook. Stem dichotomously branched, prostrate, 4 to 10 in across; herbage grayish-pubescent, and sparsely hirsute or hispid; leaves ovate to rotund, revolute, with 2 or 3 pairs of veins, 2 to 4 lines long, the petioles often longer; flowers densely clustered in the forks and at the ends of the branches, subtended by a circle of leaves; calyx-lobes linear, equaling the corolla-tube; corolla pink or whitish, 1½ lines long, bearing 5 short obtuse scales near the base of the tube; filaments shorter than the anthers, inserted nearly in the throat of the corolla-tube; nutlets oblong-ovate,

polished, the scar linear.—East side Sierra Nevada from Death Valley to Lassen Co.; n. to Wash., e. to Wyo., Utah and Ariz.

2. **C. brevícalyx** Wats. Stems white-barked, dichotomously branched from a woody perennial base, 5 to 10 in. long; herbage grayish-pubescent and somewhat hispid; leaves ovate to rhombic, with sinuate revolute margins, irregularly 2 or 3-nerved, 2 to 4 lines long, hispid toward the margin; calyx 1 line long, the acute lobes shorter than the tube; corolla 2 lines long; filaments slender, somewhat dilated below the insertion; nutlets subglobose.—Colorado Desert. Mar.-Apr.

3. **C. pálmeri** Gray. Stems freely branched dichotomously from a suffrutescent base, forming a dense rounded tuft or mat; herbage grayish-pubescent, not hispid or hirsute; leaves obovate, sometimes ovate, strongly plicate, with 5 or 6 pairs of veins, 2 to 4 lines long, the margins thickened-revolute; flowers clustered in the forks and at the ends of the branchlets, subtended by a circle of leaves; calyx-lobes about ⅔ as long as corolla-tube; corolla bluish, 2 lines long, with 5 narrowly intruding plates extending from the base of the tube to the base of the filaments or about ⅛ the length of the tube; nutlets globular, with an orbicular scar, only 1 or 2 maturing.—Desert sandhills: e. Mohave Desert; Colorado Desert; e. to Ariz. Apr.-May. (C. plicata Cov.)

4. **C. canéscens** DC. Stems gnarled, woody and rough-barked, prostrate or procumbent, from a stout perennial base; herbage tomentose and hispid; leaves ovate or oblong, entire, the veins obscure, 3 to 5 lines long, the blade longer than the petiole; flowers 3 lines long, solitary or in small clusters at the axils or forks; fruit depressed-globose; nutlets 4, thick-walled, smooth and rounded on the back, obscurely rugose on the plane sides, pointless.—Colorado Desert; e. to southern Tex. Apr.-May.

4. CYNOGLÓSSUM L.

Ours perennial herbs. Flowers blue or pink, in a bractless panicle or raceme on a naked terminal peduncle. Corolla with a ring of conspicuous appendages or crests at the throat. Nutlets large, covered all over with short barbed prickles and thus bur-like. (Greek kuno, dog, and glossa, tongue, on account of the shape and texture of the leaves in some species.)

798. Cynoglossum grande Dougl.: *a*, fl. branchlet x 1; *b*, nutlet x 1½.

Stems glabrous or nearly so; leaves ovate to ovate-oblong or elliptic, rounded or truncate at base, all on long petioles ..... 1. *C. grande.*

Stems with spreading hairs; leaves obovate to oblong-lanceolate, varying to oblong, the upper sessile or partly clasping by a rounded or auriculate base ..... 2. *C. occidentale.*

1. **C. grándе** Dougl. WESTERN HOUND'S TONGUE. Fig. 798. Stems erect, glabrous, 1 to 3 ft. high; leaves mostly basal or borne on the lower part of the stem, hirsutulose beneath, 3 to 8 in. long, on petioles often as long; calyx-lobes narrowly oblong, obtuse, densely pubescent, 2 to 4 lines long; corolla 4 to 7 lines long, the tube often purple, the lobes elliptic; nutlets depressed.—Wooded cañons, 100 to 4000 ft.: Coast Ranges from the Santa Lucia Mts. to w. Alameda Co.; North Coast Ranges from Marin Co. and the Vaca Mts. to Siskiyou Co., thence se. in the Sierra Nevada foothills to Eldorado Co. and Tuolumne Co., recurring in Tulare Co.; n. to Wash. Feb.-May.

2. **C. occidentàle** Gray. Fig. 799. Stems erect, leafy, 1 to several from the root-crown, 1 to 1½ ft. high; herbage hirsute, the hairs (especially of the stems) spreading or even recurving; leaves 2 to 7½ in. long, the lower petioled, the upper sessile or clasping; calyx-lobes linear to lanceolate, obtuse, twice longer than the tube; corolla brownish-pink, drying greenish, 4 to 4½ lines long, the tube longer than the calyx-lobes

and 2 to 3 times as long as the corolla-lobes; nutlets almost globular, 4 lines long.—Moist thickets or woods of mountain slopes and flats, 4000 to 7000 ft.: Sierra Nevada from Tulare Co. to Shasta Co.; Modoc Co. to Trinity and Humboldt Cos. June.

5. **LÁPPULA** Moench. Stick-seed

Tall leafy-stemmed herbs; herbage pubescent or hispid. Flowers usually small, blue, white or sometimes pink, disposed in spikes or racemes. Leaves entire, the upper sessile, the lower tapering to a winged petiole. Calyx 5-parted. Corolla rotate or short-funnelform, usually with appendages in the throat. Nutlets bur-like, armed with barbed prickles, these arranged along a distinct margin or over the entire back. (Diminutive of the Latin lappa, a bur.)

Annuals; racemes leafy throughout, the leaves small but still foliaceous; calyx in fruit longer than the pedicels; pedicels in fruit remaining erect; desert areas.
Dorsal area of nutlets bordered by a row of prickles.....1. *L. occidentalis.*
Dorsal area of nutlets with its margin annular-thickened, the ring bearing a few prickles.....2. *L. texana.*
Perennials, the stems from a thick root-crown; racemes leafy-bracteate only at base, the bracts above the base minute; calyx in fruit shorter than the pedicels; pedicels in fruit recurving or deflexed.
Dorsal area of nutlets naked or with very few prickles.
Corolla white, 6 to 8 lines in diameter; panicle with markedly divergent branches. 3. *L. bella.*
Corolla blue, 2 to 4 lines in diameter; racemes or panicles rather strict..... 4. *L. floribunda.*
Dorsal area of nutlets with numerous prickles.
Corolla white, 3 lines in diameter, the tube not exceeding the calyx..... 5. *L. californica.*
Corolla blue, the tube 1½ to 2 times longer than the calyx.
Limb of corolla 5 to 7 lines broad; pubescence velvety.....6. *L. velutina.*
Limb of corolla 3 to 4 lines broad; pubescence somewhat roughish, not velvety.....7. *L. nervosa.*

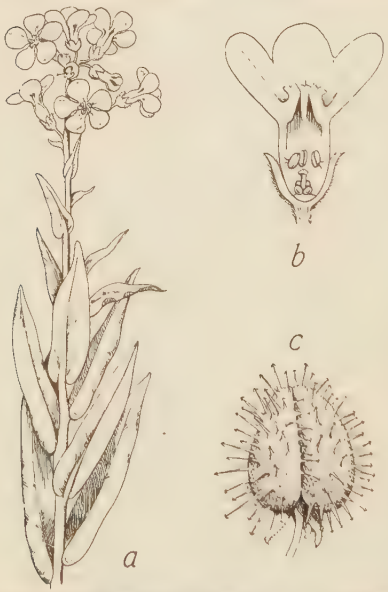
1. **L. occidentàlis** Greene. Stem strictly erect, commonly branched only above, 8 to 14 in. high; herbage pubescent; leaves linear to oblong-linear or the lower spatulate, ½ to 1¼ in. long; racemes leafy-bracteate; calyx longer than the pedicels, the narrowly lanceolate segments not recurved in fruit; corolla blue, the tube little exceeding the calyx, the throat with conspicuous crests; nutlets 1 line long, the dorsal area ovate, sharply tuberculate, bordered by a single row of barbed prickles, the prickles more or less confluent at base.—Arid valleys and mountain slopes, 4000 to 7000 ft.: San Bernardino Mts.; Inyo Co.; Lassen and Modoc Cos.; Nev. to Ore., Col. and Tex.

2. **L. texàna** Britt. Stem branched from or near the base, the branches ascending, 7 to 11 in. high; leaves 3 to 12 lines long, broadly linear, ovate-lanceolate, obtuse, sessile, the lowest oblanceolate; nutlets finely tuberculate, the dorsal face with the margin strongly annular-thickened, thus making the face saucer-shaped or shallowly cup-shaped; annular thickening bearing a few prickles, especially on upper part.—Desert mesas, 1300 to 4000 ft., e. Mohave Desert: New York Mts.; Needles; e. to Tex.

799. Cynoglossum occidentale Gray; *a*, habit x ¼; *b*, corolla x 1½; *c*, long. sect. of fl. x 2; *d*, fr. x 1.

3. **L. bélla** Mcbr. Stem erect, branched above, 1¾ ft. high; herbage finely appressed-pubescent; cauline leaves oblong-lanceolate to ovate, sessile by a cordate base, 1½ to 3¾ in. long; basal leaves oblanceolate; inflorescence widely racemose-paniculate; pedicels recurved in fruit; calyx-lobes ovate, reflexed in fruit; corolla white, 6 to 8 lines in diameter, the appendages finely pubescent; nutlets 2½ lines high, the broadly ovate back roughened, naked or with a few very minute prickles, bordered by a row of slender prickles, the prickles not confluent at base or rarely so. — Salmon Mts., Trinity Co.

4. **L. floribúnda** (Lehm.) Greene. Stem erect, 2 to 3¼ ft. high; herbage somewhat hispid-pubescent; cauline leaves linear-oblong to lanceolate or oblong-lanceolate, narrowed at base, but sessile, 1 to 5 in. long, the basal oblanceolate, drawn down to a petiole; racemes strict, more or less branched or paniculate; pedicels in fruit deflexed, 2 to 4 lines long; calyx-lobes ovate; corolla blue, about 3 lines long, about as broad; nutlets 2 lines long, the elongate-triangular dorsal face merely scabrous, bordered by a row of conspicuously flattened spines, the spines unequal, somewhat united at base into a narrow wing; back of nutlets minutely papillate, naked or with 1, 2 or 3 small bristles, commonly with a median nerve.—Montane, 6000 to 7200 ft.: e. Mendocino Co. to Siskiyou Co.; Sierra Nevada from Tulare Co. to Nevada Co., and n. to Modoc Co.; n. to Ore. and Saskat., e. to Minn. July. Var. GEISIÀNA Jepson n. var. Cauline leaves oblong, those of the inflorescence ovate with cordate-clasping base; calyx-lobes oblong; nutlets 2½ lines high. — Placer Co. (Crags Slope, Deer Park, Helen D. Geis, type).



800. Lappula velutina Piper; *a*, fl. branchlet x ½; *b*, long. sect. of fl. x 2; *c*, fr. x 3.

5. **L. californica** (Gray) Piper. Stems erect, 1½ to 2 ft. high; herbage pubescent; leaves ¾ to 3½ in. long, upper cauline oblong to lanceolate, sessile, the lower cauline and basal oblong, tapering to a long petiole; racemes widely branched; calyx-lobes ovate; corolla white, the tube not or barely exceeding the calyx, the limb 3 to 6 lines broad; nutlets 2½ lines high, the ovate dorsal face beset and also bordered with bristles. — Montane, 5000 to 7300 ft.: Sierra Nevada from Butte Co. to Tehama and Modoc Cos.; also Inyo Co.

6. **L. velùtina** Piper. Fig. 800. Stems erect, 1 to 2 ft. high; herbage velvety-pubescent; leaves 1 to 3 in. long, the cauline oblong-lanceolate to ovate, the basal oblong-spatulate; racemes simple or branched; calyx-lobes ovate, obtuse; corolla blue or sometimes pink, the tube much exceeding the calyx, the limb 5 to 6 lines broad, the crests conspicuous, ⅓ as long as the corolla-lobes; nutlets with back thickly beset with prickles.—Montane, 5000 to 8500 ft.: Sierra Nevada from Tulare Co. to Shasta Co. June-July.

7. **L. nervòsa** (Kell.) Greene. Stems 1 to 3, erect, 1½ ft. high, glabrous or sparingly hairy; leaves rough-pubescent, ¾ to 3½ in. long, pubescent, ciliate, the cauline oblong to ovate, the basal oblong to oblong-spatulate; racemes somewhat loose or with spreading branches; calyx-lobes ovate; corolla blue, the tube much exceeding the calyx, the limb 2 lines broad, the throat with small crests only ⅛ as long as lobes; dorsal area of nutlets broadly ovate, covered with prickles.—Montane, 6000 to 7000 ft.: Sierra Nevada from Fresno Co. to Plumas Co. June-July.

6. PECTOCÀRYA DC.

Low slender obscure annuals with strigose pubescence and narrowly linear leaves. Flowers minute, white, on very short pedicels, scattered along the stems or branches. Calyx deeply 5-cleft, spreading or reflexed in fruit. Corolla with a circle of processes or crests which almost close the throat. Stamens included. Nutlets flat, thin, radiately divergent, bordered at apex or all around with a row of bristles hooked at tip. (Greek pectos, combed, and karua, nut, on account of the row of bristles on the nutlet.)

Nutlets not winged, the acute margin bordered all around by bristles; calyx hispidulose.... 1. *P. pusilla.*

Nutlets bordered by a wing.

Wing coriaceous, undulate or laciniate; calyx hispidulose.

Wing parted or cleft into subulate teeth ending in a delicate uncinate bristle.... 2. *P. linearis.*

Wing merely undulate or incurved, the apex thickly and the sides rarely beset with slender uncinate bristles.... 3. *P. penicillata.*

Wing thin-scarious, entire or obscurely undulate, the hooked bristles of the body extending beyond its margin; calyx armed with divergent bristles.. 4. *P. setosa.*

1. **P. pusílla** Gray. Stem erect, somewhat flexuous, simple or sparingly branched, 3 to 5 in. high; herbage strigulose-canescent; nutlets 4 and equably divergent (or sometimes but 2), 1 line long, cuneate-obovate or somewhat rhomboidal, carinately nerved on the upper face, not winged, the margin bearing a row of slender bristles hooked at the tip.—Shady north slopes in the hills, 500 to 2500 ft.: North Coast Ranges from Napa Co. to Siskiyou Co.; thence se. in the Sierra Nevada to Mariposa Co. Mar.-Apr.

2. **P. lineàris** DC. Stem diffusely branched from the base, the branches 2 to 4 in. long; body of nutlets narrowly oblong, 1 to 2 lines long, surrounded by a broad wing laciniately and often irregularly parted or cleft into subulate teeth, the teeth ending in a delicate bristle uncinate at tip; cotyledons oblong.—Valleys and mesas, 500 to 2100 ft.: coastal S. Cal.; Colorado and Mohave deserts; Inyo Co.; e. to Ariz. and Utah. Apr.-May.

3. **P. pénicillàta** (H. & A.) A. DC. Stem branching at the base, the branches diffuse, 1 to 4 in. long; nutlets divergent in pairs, oblong, 1 line long, surrounded by a wing which is incurved along the middle in age and bears at the rounded apex a series of slender bristles hooked at the tip.—Hillslopes and valleys, 100 to 400 ft., throughout cismontane Cal.; n. to B. C., e. to Nev. Var. HETEROCÁRPA Jtn. Two of the 4 nutlets unmargined, 2 margined.—Colorado Desert.

4. **P. setòsa** Gray. Stem stoutish, freely and diffusely branched, 6 to 9 in. high; herbage hispid as well as minutely strigose-pubescent; calyx-lobes armed with 3 to 6 large divergent bristles; nutlets in pairs, 2 wingless, 2 bordered by a broad thin-scarious wing, the body of the nutlet and commonly also the wing beset with slender uncinate-tipped bristles, the body rarely naked or nearly naked, the wing entire or obscurely undulate.—Desert mesas or their bordering ranges, 2000 to 4500 ft.: San Jacinto Mts.; San Antonio Mts.; Mohave Desert; Lassen Co. Apr.-May. Var. HOLÓPTERA Jtn. Nutlets all wing-margined.—Mts. on n. side Mohave Desert; also Inyo Co. Var. ÁPTERA Jtn. Nutlets all without margins.—E. San Diego Co.

7. MERTÉNSIA Roth. LUNGWORT

Perennial herbs with erect leafy stems terminated by clusters of showy light blue flowers. Herbage glabrous or nearly so. Leaves broad, the lower mostly petioled. Stamens with flattened or filiform filaments inserted on the crested open throat of the corolla. Style filiform; stigma entire. Nutlets attached to the convex receptacle by a small scar just above the base, roughish or wrinkled at maturity. (F. K. Mertens, a German botanist, 1764-1831.)

Calyx-lobes oblong or oblong-linear, mostly obtuse; corolla-tube 2½ to 3 lines long, about as long as the throat and limb, with an obscure or shallow depression on the outside opposite the crests; var. stomatechoides of.... 1. *M. ciliata.*

Calyx-lobes lanceolate or linear, mostly acute; corolla-tube 4 to 5½ lines long, 3 to 4 times as long as the throat and limb, with a pair of pockets or rounded pits on the outside opposite the crests.... 2. *M. longiflora.*

801. Mertensia ciliata var. stomatechoides Jepson; *a*, fl. branchlet x ½; *b*, leaf x ¼; *c*, sect. of corolla x 1½.

1. **M. ciliàta** (James) G. Don var. **stomatechoides** Jepson n. comb. Fig. 801. Stems several from the root-crown, simple or somewhat branched, leafy, 2 to 5 ft. high; herbage glabrous or nearly so, glaucous; leaves oblong or oblong-spatulate to ovate or lanceolate, entire, 2 to 7 in. long, narrowed to a broad petiole, or the upper cauline ones sessile; flowers in short panicled racemes at the ends of the stem and branchlets, more or less drooping; calyx-lobes oblong to oblong-linear or -lanceolate, obtuse or sometimes acute, mostly ciliolate, ¼ to ½ as long as the corolla; corolla a lively light-blue, with small yellow-tipped crests in the summit of tube, the cylindrical tube 2½ to 3 lines long, the open-campanulate throat and limb nearly or quite as long; filaments broad, included, inserted on the corolla-tube alternate with the crests; style exserted.—Montane, 5000 to 8500 (or 10,000) ft.: e. Mendocino Co.; Sierra Nevada from Tulare Co. to Nevada Co. and n. to Modoc Co.; e. to Col. (Mertensia stomatechoides Kell. M. sibirica Bot. Cal.) June-Aug.

2. **M. longiflòra** Greene. Stem erect, simple, leafy, ½ ft. high; herbage glabrous or nearly so, the upper side of the leaves scabridulous; leaves oblong-ovate or spatulate-obovate, 1 to 2¼ in. long; flowers in a close cluster or subcorymbose panicle; calyx deeply 5-parted or cleft, the lobes lanceolate or linear, mostly acute; corolla bright blue, the tube narrow, 4 to 5½ lines long, the throat very short, the limb 5-lobed, 1 to 1½ lines long.—Hillsides, 5000 to 7000 ft.: Modoc Co.; n. to B. C., se. to Ariz. Apr.-May.

8. MYOSÒTIS L. Forgetmenot

Slender leafy-stemmed perennials with small light blue flowers in loose naked racemose clusters terminating the stem and branchlets. Corolla rotate with prominent crests in the throat. Nutlets small, ovoid, smooth and shining. (Greek mus, mouse, and otos, ear, mouse-ear, to which the leaves of some species are likened.)

1. **M. sylvática** Hoffm. Stems leafy, somewhat branched above, 1 ft. high, decumbent at base, usually several from a perennial rootstock; herbage hirsute-pubescent, the stem with soft spreading hairs, those of the calyx consisting of bristly hairs with hooked tips; leaves lanceolate or oblong to oblong-spatulate, entire, 1 to 4 in. long, the basal and lower cauline petioled; calyx-lobes lanceolate, equaling or longer than the tube; corolla light blue. Garden plant from Eur., sparingly naturalized: San Anselmo; Mill Valley; Berkeley; San Francisco. Apr.-July.

M. palústris With. Calyx-lobes triangular, shorter than the calyx-tube; pubescence appressed, that of the calyx consisting of straight hairs.—Adv. from Eur.: Quincy.

9. LITHOSPÉRMUM Tourn. Puccoon

Ours pubescent or hairy perennial herbs, usually with red or violet-colored roots containing coloring matter. Flowers in leafy spikes or in the axils of the upper leaves. Calyx 5-parted. Corolla in ours greenish-yellow, salver-

form or funnelform, with rounded lobes imbricated in the bud. Filaments short; anthers short, included. Style slender; stigma truncate-capitate or 2-lobed. Nutlets 4 or by abortion fewer, ovate, naked, in ours white, bony and shining, erect, attached to the flat receptacle by the base; scar flat, rather small. (Greek lithos, a stone, and sperma, a seed.)

1. **L. ruderàle** Dougl. Stems densely leafy, ½ to 1¼ ft. high; herbage pubescent; leaves linear-lanceolate to lanceolate, 1 to 2¾ in. long, mostly tapering from base to apex, sessile; flowers crowded in a leafy cluster; corolla campanulate-funnelform, dull greenish-yellow, 4 to 5 lines long, the tube hardly longer than the calyx, silky outside, the open throat naked or nearly so; nutlets broadly ovate, acute, smooth and polished, 2 to 2½ lines long.—Modoc Co.; n. to B. C., e. to Nev. and ne. to N. Dak. May. Var. CALIFÓRNICUM Jepson n. comb. Stems less rigid; upper leaves oblong or ovate-lanceolate; corolla orange-yellow, 5 to 6 lines long, the tube considerable longer than the calyx.—Montane, 3000 to 5000 ft.: Placer Co. to Shasta Co., thence w. to Trinity Co., n. to southern Ore. (L. californicum Gray.)

10. AMSÍNCKIA Lehm.

Annuals with rough-hairy herbage, the hairs commonly with pustulate-dilated base, which is often conspicuously hardened or granular. Flowers yellow, in elongated spikes. Calyx-lobes 5, or 4 or 3 through the more or less complete union of two into one. Corolla salverform, the throat somewhat funnelform and with more or less distinct folds, but destitute of crests or processes. Nutlets crustaceous, triquetrous or ovate-triangular, smooth or rough. Cotyledons deeply 2-parted. (Wm. Amsinck of Hamburg, patron of the Botanic Garden in that city.)

Nutlets smooth and polished.
- Corolla 5 to 6 lines long; scar of nutlets very obscure, narrowly lineate, nearly basal; mostly deserts ..... 1. *A. vernicosa.*
- Corolla about 6 to 7½ lines long; scar of nutlets conspicuous, ovate-lanceolate, nearly median; S. F. Bay region ..... 2. *A. spectabilis.*

Nutlets roughened.
- Corolla 2 to 2½ lines long ..... 3. *A. parviflora.*
- Corolla 4 to 9 lines long.
  - Nutlets carinate on back, more or less rugulose or muriculate.
    - Nutlets gray or pale; mostly interior, very common ..... 4. *A. douglasiana.*
    - Nutlets black or brown; seaboard ..... 5. *A. intermedia.*
  - Nutlets flattened or rounded on the back.
    - Back of nutlets with low thin or faint rugae, the rugae forming areoles ..... 6. *A. lycopsoides.*
    - Back of nutlets tessellate or pavement-like ..... 7. *A. tessellata.*

1. **A. vernicòsa** H. & A. Stem stout, branching above, 7 to 18 in. high, mostly glabrous below; leaves linear-oblong to ovate-lanceolate or lanceolate, 1½ to 5 in. long, hispid-ciliate and more or less hispid above and below, often glabrate, the pustulate disks frequently producing a tessellate effect; fully developed spikes 5 in. long; calyx-segments strongly hirsute, often partly or wholly confluent so as to appear as 3 or 4, in fruit 5 to 7 lines long; corolla golden yellow, 5 to 6 lines long, the limb narrow; nutlets carinate on the lateral angles with sharp edges, back and lateral faces plane or nearly so, smooth and polished, gray, 2 to 3 lines long, the scar very narrow or hair-like.—Mohave Desert to Inyo Co., 4000 to 4500 ft. Apr.-May.

2. **A. spectábilis** F. & M. Stem erect, rather strictly branched above, about 2 ft. high; herbage rough-hispid; leaves linear-oblanceolate or -oblong, 1 to 3½ in. long, the reduced upper ones narrow-ovate or -lanceolate; corolla yellow, 7 to 9 lines long.—Antioch; Judsonville. Too little known.

3. **A. parviflòra** Hel. Stem erect, strictly branched above, 5 to 12 in. high, hispid with spreading hairs and also somewhat strigose; leaves mostly linear, 1 to 2½ in. long; corolla pale yellow, 2 to 2½ lines long; nutlets brown, finely papillate or slightly muriculate, faintly rugulose, 1 to 1¼ lines long, the scar large, ovate.—Sierra Nevada, 3000 to 6000 ft., from Mariposa Co. to Plumas Co.

A. ECHINÁTA Gray. Erect, 1½ to 2½ ft. high, very hispid with white spreading bristles; sepals very narrow, yellow-hispid; corolla light yellow, about twice as long, little dilated at the throat, the limb 2 or 3 lines broad; nutlets muricate with slender points or almost prickly, not rugose.—Sandy

plains, very rare: Camp Mohave and Maricopa, Ariz. To be looked for in e. Mohave Desert.

4. **A. doúglasiàna** DC. BUCKTHORN WEED. Erect, frequently widely branched, 1½ to 4 ft. high; stems and branches with scattered white bristles, the foliage densely hispid-bristly with rather shorter bristles; inflorescence hispid and with a short curly pubescence; leaves oblong-lanceolate to linear, thickish, entire, 1 to 9 in. long; racemes more or less crowded at the top of the stem or branches and leafy-bracteate; developed racemes 5 to 10 in. long, peduncled; calyx-segments rusty-hispid, linear-acuminate, ½ as long as the narrow orange-yellow corollas, in fruit twice as long at least as the nutlets; nutlets incurved, carinate dorsally, scabrous-rugose and granulate, exceeding 1 line in length.—Fields and hillslopes, often forming rank thickets, 20 to 2000 ft.: Great Valley; Coast Ranges; coastal S. Cal. Apr. Also called Fireweed and Zaccato Gorda. (A. intermedia Fl. W. Mid. Cal.) Var. CAMPÉSTRIS Jepson n. comb. Calyx with appressed pubescence.—Sacramento Valley and n. to Siskiyou Co. (A. campestris Greene.) Var. EASTWOÓDAE (Mcbr.) Jtn. Corolla 8 to 9 lines long, 2 to 3 times as long as the calyx.—Sierra Nevada foothills from Amador Co. to Fresno Co. and s. to Tehachapi Range. (A. eastwoodae Mcbr.)

802. Amsinckia intermedia F. & M.; *a*, leaf x ⅓; *b*, fl. branchlet x ½; *c*, long. sect. of fl. x 2; *d*, nutlet, dorsal view x 5; *e*, nutlet, ventral view x 5.

5. **A. intermèdia** F. & M. Fig. 802. Stem erect, branching, the branches at length decumbent, 1 to 2 ft. long; herbage of a light yellowish green, setose-hispid; leaves ovate-lanceolate or narrowly oblong, with erose-sinuate or entire margins; racemes rather short, frequently leafy-bracteate; peduncles short or none; calyx sparsely setose-hispid, the lobes lanceolate or ovate-oblong, obtuse, 2 or 3 of the lobes often united; corolla pale yellow, very slender; nutlets brown or blackish, muriculate and rugulose, scarcely more than ½ line long.—Sandy soil along the seacoast: San Diego Co. to San Francisco, Sonoma and Mendocino Cos. and n. (A. lycopsoides Jepson.) Var. NÍCOLAI Jepson n. comb. Racemes leafy-bracteate throughout.—San Nicolas Isl. (A. sancti-nicolai Eastw.)

6. **A. lycopsoìdes** Lehm. Diffuse plant; similar to no. 5; nutlets rounded on the back, not carinate, the thin low rugae forming irregular areoles these minutely granulate.—Along the coast: Mendocino Co.; n. to Wash.

7. **A. tessellàta** Gray. Coarsely hispid, 1 to 2 ft. high; leaves linear to oblong-lanceolate, or the upper ovate, 1 to 2 in. long; developed spikes 5 to 6 in. long, loose; calyx of 3 or 4 sepals, 1 narrow and 2 broad, or 3 narrow and 1 broad, rusty-hispid, accrescent in fruit with the broadly-ovate foliaceous segments about twice the length of the nutlets; corolla small, orange-yellow; nutlets broadly ovate, abruptly acute, not carinate but flattish on the back, which is surrounded by a dentate border and filled in with a few short transverse rugae and many wart-like projections fitted closely together, and so resembling a somewhat uneven cobble-stone pavement. — Sandy plains or desert mesas, 100 to 4000 ft.: Colorado and Mohave deserts; San Joaquin Valley; Inyo Co.; e. to Utah. Apr.-May. Var. LEMMÒNII Jepson n. comb. Calyx densely clothed with soft-appressed cinnamon-brown hairs; corolla

6 to 7 lines long, the limb much broader; nutlets tessellate but scarcely rugose.—San Luis Obispo and Monterey Cos. May. (A. lemmonii Mcbr.)

11. **OREOCÀRYA** Greene

Perennial herbs, the leafy stems more or less tufted on the branched root-crown and terminating in a thyrsoid or spicate leafy-bracteate panicle. Entire plant tomentose or strigose-pubescent, the upper parts usually densely hispid. Leaves mostly basal. Calyx 5-parted to the base or nearly so, the segments lanceolate or ovate-lanceolate. Corolla with prominent crests. Nutlets smooth and polished or roughened and dull, the margins without wings. (Greek oreos, mountain, and karua, nutlet, on account of the habitat.)

Nutlets polished; herbage strigose or strigulose.
Corolla-tube well-exserted (1½ to 2 times as long as calyx); inflorescence hirsute; stems ½ to 1⅓ ft. high.....1. *O. confertifolia.*
Corolla-tube not exserted; inflorescence not at all hirsute; stems 3 to 5 in. high; var. abortiva of.....2. *O. suffruticosa.*
Nutlets roughened, dull; herbage hispid, the older leaves white-tomentose, the younger ones greenish-silky.
Nutlets gray, keeled, densely rugose and often finely tuberculate dorsally.....
3. *O. echinoides.*
Nutlets brown, narrow-ovate, weakly keeled, sparingly wrinkled.....4. *O. nubigena.*

1. **O. confértifòlia** Greene. Stems erect or at base decumbent, leafy, ½ to 1⅓ ft. high, arising from a branched root-crown; herbage strigose-pubescent with silky hairs, above more or less hirsute; leaves mostly in a basal tuft and some on stem, especially lower part, oblanceolate to linear-lanceolate, acute, 1 to 3 in. long; basal leaves more particularly drawn down to a petiole, the petioles white-silky; inflorescence spicate-glomerate, more or less interrupted below; calyx-lobes lanceolate; corolla cream-color or yellow, the tube well-exserted, the crests prominent; nutlets ovate, keeled ventrally, rounded on the back, smooth and polished.—Arid montane slopes or summits, 5000 to 8500 ft.: e. slopes or easterly summits of the Sierra Nevada from Kern Co. to Mono Co.; White Mts.; s. to north slope San Bernardino Mts.; e. to Utah and N. Mex.

2. **O. súffruticòsa** Greene var. **abortìva** Mcbr. Stems decumbent or several from the root-crown, diffuse, leafy, branching, 3 to 5 in. long; herbage covered with a fine strigose puberulence, the leaves setose-ciliate toward the base; flowers in a close thyrsoid panicle, leafy-bracteate; leaves linear-oblanceolate or linear, 2 to 4 in. long, mostly exceeding the panicles; calyx-tube ovate-lanceolate, the tube very short; corolla white, the tube not exserted, the lobes rounded; nutlets 1 to 4, irregularly triangular, polished, mottled on ripening.—Montane, 6000 to 10,200 ft.: northerly flats, San Bernardino Mts.; White Mts.; e. to Nev.

3. **O. echìnoides** Mcbr. Stems few, ascending or erect, leafy, 3 to 9 in. high; herbage hispid throughout with long whitish hairs; leaves spatulate, mostly tufted at or near the base, ¾ to 1¾ in. long; inflorescence a spike-like thyrsus, leafy-bracteate below; calyx-lobes ovate-lanceolate, densely hispid; corolla yellow, its tube scarcely exceeding the calyx, the lobes rounded, the crests prominent; nutlets gray, ovate, keeled dorsally, sulcate ventrally, rugose and finely tuberculate.—Desert ranges or arid slopes of ranges bordering the deserts, 4000 to 6000 ft.: San Bernardino Mts.; Providence Mts.; Ivanpah Mts.; Panamint Mts.; Silver Mt., Mono Co.; Squaw Valley, Truckee River; e. to Utah, n. to Can. June.

4. **O. nubígena** Greene. Stems erect, leafy, 3 to 5 in. high, usually several from the branched root-crown; herbage hispid with long yellowish hairs, densely so above, tomentulose throughout; leaves spatulate-obovate, mostly in a basal tuft, ¾ to 1¾ in. long, the basal narrowed to a petiole; inflorescence contracted into a dense cluster or shortly spike-like; calyx-lobes ovate-lanceolate; corolla white with yellow center, the tube little or not at all exserted, the lobes broad and rounded, the throat with prominent crests; nutlets brown, narrow-ovate, sparingly rugose or wrinkled.—Summits of the Sierra Nevada, 4000 to 12,000 ft.: Modoc Co.: Sonora Pass; Clouds Rest; Mt. Whitney; also White Mts. May-July. Well-developed mature fruit is still unknown.

12. **GREENEÓCHARIS** Gurke & Harms

Low, diffusely branching annuals, the small white flowers leafy-racemose and leafy-glomerate. Herbage hispid-canescent. Calyx 5-cleft to the middle, the scarious tube circumscissile about midway, the upper part falling, the lower persistent around the small ovate nutlets. (E. L. Greene, writer on western borages, and Greek charis, grace or beauty.)

1. **G. circumscíssa** (Torr.) Rydb. Stem slender, diffusely much branched, 1½ to 7 in. high; leaves linear, alternate or some of the lower opposite, 3 to 7 lines long; flowers sessile in the axils of the leaves or crowded in leafy-bracteate clusters at the ends of the branchlets; calyx early circumscissile: corolla 1 line long, the throat naked and open; nutlets ovate, rounded on the back, dull, smooth or puncticulate, ½ line long.—Desert mesas or mt. slopes, 4000 to 6500 ft.: Mohave Desert and its bounding mountain ranges; n. along east side Sierra Nevada to Lassen Co.; n. to Wash., e. to Utah. May-June. (Piptocalyx circumscissus Torr.) Var. DICHÒTOMA Jepson n. comb. Seeds smooth and shining, ½ to ¾ line long.—E. slope Sierra Nevada from Inyo Co. to e. Nevada Co. (Boca); Verdi, w. Nev. July-Aug. (Krynitzkia dichotoma Greene.)

13. **CRYPTÁNTHA** Lehm. NIEVITAS

Annuals, rarely biennials or perennials. Flowers nearly always sessile and scorpioid-spicate. Calyx 5-parted to the base, as long as the corolla-tube: segments more or less hispid or with hooked bristles, in fruit usually closely embracing the nutlets, eventually deciduous. Corolla white, small (½ to 3 lines broad). Nutlets 4, sometimes 3, 2 or 1, smooth, papillate, or muriculate, never rugose; face of nutlet with a ventral groove from the apex to the scar near the base, usually continued beyond the scar as a fork and either open (areolate) or closed. Nutlet attached to the subulate gynobase from the scar halfway or wholly to the apex along the groove. (Greek kruptos, hidden, and anthos, flower, perhaps on account of the minute flowers in some species.)

A. INFLORESCENCE BRACTEATE.

Floral bracts not exceeding flowers; annuals.
- Lower leaves not exceeding ½ in. ..... 1. *C. micrantha.*
- Lower leaves more than ¾ in. ..... 2. *C. costata*

Floral bracts exceeding flowers.
- Biennial or perennial; nutlets broad, mucronulate ..... 3. *C. racemosa.*
- Annual; nutlets lanceolate, brown, polished ..... 4. *C. ramosissima*

B. INFLORESCENCE NOT BRACTEATE; ANNUALS.

1. Nutlet surface roughened.

Fruiting calyx, including pedicel, seldom more than 2 lines long.
- Calyx in fruit recurved ..... 5. *C. recurvata*
- Calyx in fruit not recurved.
  - Plants profusely branched, thickly covered with bristles or short stiff hairs; nutlets minutely white-papillate upon purplish-gray or brown.
    - Desert plants; calyx 1 line long.
      - Nutlets without margins ..... 6. *C. angustifolia*
      - Nutlets with whitish margins ..... 7. *C. holoptera*
    - Cismontane plants; calyx ½ line long ..... 8. *C. micromeres*
  - Plants scarcely branched, hispid to hirsute; nutlets conspicuously papillate or mucronate, white to brown or brown-flecked, never purplish.
    - Nutlets wingless.
      - Calyx-segments with both bristles and hairs.
        - Papillae on nutlets straight.
          - Nutlets ovate, acute ..... 9. *C. muriculata.*
          - Nutlets ovate, acuminate ..... 10. *C. ambigua.*
        - Papillae on nutlets dentate to curvidentate; nutlets lanceolate ..... 11. *C. intermedia.*
      - Calyx-segments with soft hairs but no bristles ..... 12. *C. utahensis*
    - Nutlets winged; calyx-segments with soft hairs but no bristles ..... 13. *C. pterocarya.*

Fruiting calyx, including pedicel, three lines long or more; calyx-segments densely covered with long soft hairs.
- Lower leaves about 1 line wide; calyx-segments silky-villous ..... 14. *C. crinita*
- Lower leaves 2 to 3 lines wide; calyx-segments hirsute ..... 15. *C. barbigera.*

2. Nutlet surface smooth.

Nutlets ovate-lanceolate.
- Stems strigose; plants of interior foothills and mountains.

Spreading montane plants, 2 to 4 in. high.....16. *C. glomeriflora.*
Erect foothill plants, 5 to 18 in. high.....17. *C. flaccida.*
Stems with spreading pubescence; coast or coast ranges.....18. *C. leiocarpa.*
Nutlets ovate-acute.
Plants stout; calyces with stiff bristles, fruiting calyx-lobes elongated.....
19. *C. torreyana.*
Plants slender; calyces with softer bristles, fruiting calyx-lobes scarcely if at all elongated.....20. *C. affinis.*

1. **C. micrántha** (Torr.) Jtn. Stems slender, leafy, 2 to 5 in. high, diffusely much-branched from the base; root carrying purple stain; herbage grayish with somewhat appressed hispid hairs; leaves linear, 2 lines long; flowers in the axils of the leaves or crowded in leafy clusters at the ends of the branchlets; calyx-lobes oblong, obtuse; corolla 1 line long, the throat obscurely appendaged; nutlets ovate, acuminate, purplish-gray, polished, one or more commonly mucronulate.—Desert or arid valleys and mountain slopes, 1000 to 6000 ft.: Mohave and Colorado deserts and their bordering ranges s. and w.; San Bernardino Valley. Apr.-June. (Eremocarya micrantha Greene.) Var. LÈPIDA Jtn. Stems less slender and only sparsely hispid; corolla larger with the appendages in the throat less obscure.—Montane, 4500 to 6800 ft.: San Bernardino and San Jacinto mountains to mts. of e. San Diego Co. June-Aug. (Eremocarya lepida Greene.)

2. **C. costàta** Bdg. Stem profusely branched throughout, 3 to 6 in. high; stems and leaves gray with appressed hispid hairs, these interspersed with more sparse spreading longer and stiffer hairs; leaves lanceolate, the lower leaves ¾ to 1 in. long; flowers minute, in dense leafy-bracteate spikes, the bracts and sepals closely beset with long rigid white or yellowish bristles with softer shorter hairs between; sepals lanceolate, 1 to 1½ lines long, in fruit twice as long; nutlets ovate, ½ line long, minutely roughened but shining, rounded on the back, with sharp edges, the ventral groove dilated from above the middle downward.—Desert valleys, 200 to 1000 ft.: Colorado Desert; n. to Death Valley region.

3. **C. racemòsa** (Wats.) Greene. Stem profusely branched throughout, ½ to 1 or 2 ft. high, the ultimate branchlets almost filiform, the main stem and larger branches woody; herbage hispid with spreading bristles or the stem mostly strigose-hispid; leaves linear, ½ to 1 in. long; inflorescence loosely racemose-paniculate, the lowest flowers often on spreading pedicels, the upper nearly sessile; calyx in fruit usually about 1 line long, the segments lanceolate, bristly-hispid; corolla limb 1 line in diameter; nutlets ovate-lanceolate, unequal (the 3 smaller becoming free from the gynobase earlier, the fourth sometimes abortive), ½ line long, gray, mucronulate, the brown endocarp showing through the white coat, the margins whitish, sharp, the ventral groove open and gradually widening at base.—Deserts: Inyo Co.; Mohave and Colorado deserts; s. to L. Cal., e. to Ariz.

4. **C. ramosíssima** (Gray) Greene. Stem usually stout with many ascending branches, 5 to 11 in. high; herbage rufescent, hispid, often, also, with more appressed finer hairs; leaves linear, somewhat thickened, ½ to 1 in. long; spikes elongate in age, rather densely flowered, more or less leafy-bracteate; calyx-segments linear, 1 line long with stiff bristles of about the same length among softer hairs; corolla minute; nutlets smooth, usually solitary, lanceolate, ½ to ¾ line long, pale brownish-green with translucent pericarp, abruptly acute-margined; groove closed in perfect nutlets.—Deserts and desert mts., Inyo Co. to Colorado Desert; s. to L. Cal.

5. **C. recurvàta** Cov. Stem slender, more or less branched from below, 2 or 3 to 8 in. high; herbage appressed-hispid, or the leaves with somewhat spreading hairs; leaves linear-oblanceolate, ¼ to ¾ in. long; spikes in 2s or 3s, naked, becoming loose; calyx in fruit recurved, 1 to 1½ lines long, hispid-bristly with stiff divergent hairs; corolla minute, scarcely exserted; nutlet single, not 1 line long, ovate-lanceolate, muriculate, rounded on the angles, slightly incurved at apex, adherent to columnar gynobase for half the length of the closed ventral groove.—Mts. of Inyo Co.: White Mts.; Panamint Mts.

6. **C. angústifòlia** (Torr.) Greene. Stem diffusely branched from base, 3 to 9 in. high; herbage densely hispid with white hairs which are commonly

pustulate at base; leaves narrowly linear, 3 to 8 lines long; flowers in dense spikes; sepals narrowly linear, 1 to 1½ lines long, densely covered with stout rigid often yellowish bristles nearly as long; corolla minute, exserted; nutlets ovate-lanceolate, about ½ line long (or 1 or 2 shorter, these sometimes abortive), minutely white-papillate upon purplish-gray, the ventral groove widened toward the base.—Colorado and Mohave deserts, n. to Inyo Co.; e. to Ariz. Mar.-May.

7. **C. holóptera** (Gray) Mcbr. Stem paniculately branched, 1 ft. high; or in depauperate specimens less than 3 in.; herbage gray with spreading (or on the stems appressed) hispid hairs; leaves lanceolate, ½ to 1½ in. long, thickly white-dotted with the white pustules at the bases of the hairs; spikes naked or bracteate only at base, paniculate, finally elongate; calyx segments lanceolate, ¾ (in fruit 1½) lines long, armed with bristles nearly as long, the midrib prominent at base; corolla minute; nutlets ovate, ¾ line long, wing-margined, white-papillate upon a purplish-gray ground, the ventral groove open from the middle downward.—Colorado and Mohave deserts; n. to Inyo Co.; e. to Ariz. Mar.-Apr.

8. **C. micrómeres** (Gray) Greene. Stem slender, rather widely branched above the base, 4 to 9 in. high; herbage rough-hirsute almost throughout, the hairs not white; leaves oblong to linear, ¼ to 1 in. long; spikes mostly terminal or subterminal, ebracteate, not dense, 2 to 4 in. long; calyx ½ line long; nutlets ovate, acute, ⅓ line long, minutely papillate, ventral groove opening at base.—Foothills: South Coast Ranges from Contra Costa Co. to Monterey Co. and s. to San Diego Co.; Amador Co.

9. **C. mùriculàta** (A.DC.) Greene. Stem robust, branching, ½ to 1¼ ft. high; herbage rough-hirsute or hispid; leaves linear, ½ to 1 in. long; spikes well-developed, rather dense, mostly in 2s and 3s at the end of the branches; calyx 1½ lines long; corolla 2 to 3 lines broad; nutlets 1 line long, muricate-papillose, and somewhat rugose on the back; ventral groove and its basal bifurcation mostly closed; lateral angles acutish, distinct.—Montane, 2000 to 8000 ft.: Coast Ranges from Sonoma Co. s.; Santa Inez Mts.; Sierra Nevada from Mariposa Co. southward; San Gabriel Mts. Var. VITRÈA Jepson n. comb. Profusely branched and vigorous, very floriferous; flowers much smaller; nutlets broader. — S. Sierra Nevada in Fresno Co. (C. vitrea Eastw.)

803. Cryptantha ambigua Greene; *a*, habit x ½; *b*, fl. x 4; *c*, nutlet, dorsal view x 8; *d*, nutlet, ventral view x 8.

10. **C. ambígua** (Gray) Greene. Fig. 803. Stem much branched from the base, ½ to 1¾ ft. high; herbage rough-hirsute throughout; leaves linear, 1 to 1½ in. long; spikes 1 to 2¾ in. long, commonly very loose below, ternate or geminate, often pedunculate; calyx-segments linear, 1 to 1½ (or in fruit 2½) lines long, more densely hispid-bristly towards the base; corolla 2½ to 3 lines broad; nutlets gray, 4 or 3, narrowly ovate, papillate but not pointed or prickly, the lateral angle obtuse and the groove more or less closed, with the basal bifurcation open-areolate (or sometimes closed). — Mountain slopes, 1500 to 6000 ft.: inner North Coast Ranges from Lake Co. to Siskiyou Co., thence s. in the Sierra Nevada to Tulare Co.

11. **C. intermèdia** Greene. Stem more or less diffusely branched

from base, ½ to 1 ft. high; herbage hispid with appressed and spreading hairs; leaves lanceolate or linear, ½ to 1 in. long; spikes naked, in 2s or 3s, finally much elongated so that the flowers are remote; calyx-segments linear, scarcely 1 line long, in fruit often 2 to 3 or 4 lines long, hispid and armed with bristles 1 to 1½ lines long; corolla 2 lines broad; nutlets ovate, acuminate, roughened with unusually sharp-pointed papillae, the ventral groove open and widening at base.—Hills and valleys, 1000 to 4000 ft.: coastal S. Cal.; Colorado and Mohave deserts; Tehachapi Mts.; Inyo Co. Var. DUMETÒRUM Jepson n. comb. Diffuse flexuous branches ½ to 1 ft. high; leaves lanceolate, ½ to 1 in. long, densely studded with the conspicuous white pustules at the base of the hairs; spikes single, in 2s or 3s, finally elongating so that the flowers are distant.—Mohave Desert and bordering ranges. (Krynitzkia dumetorum Greene.)

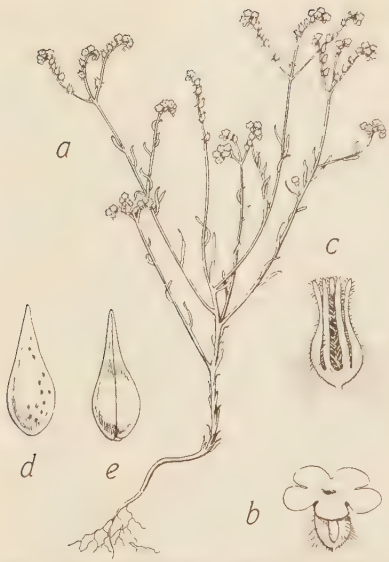
12. **C. utahénsis** Greene. Stem branched from base, ½ to 1 ft. high; herbage strigose-hispid; leaves linear, ¼ to ¾ in. long; spikes in 2s or 3s, very short; calyx 1 line long, rather densely silky-pubescent, not at all bristly; corolla 1½ lines broad; nutlets (often solitary and adhering closely to gynobase) ovate-acuminate, sharp on the edges, 1¼ lines long, papillate and somewhat nerved dorsally, the ventral groove gradually widening toward base.—Desert valleys, 2000 to 4000 ft.: cent. and e. Mohave Desert; Inyo Co.; e. to Utah. May.

13. **C. ptèrocárya** Greene. Stem slender and loosely branched or diffusely much branched from base, 6 to 9 in. high; herbage hispid with appressed or spreading hairs; leaves linear, ½ to 1 in. long; spikes short, at first glomerate, in 2s or 3s; calyx in fruit 2 lines long, the segments with a few stiff bristles, linear at first, in fruit becoming ovate, the midrib prominent; corolla not 1 line broad; nutlets ovate, papillate on the back, the edges produced into broad scarious somewhat crenate wings (or 1 nutlet wingless), the ventral groove open or closed, with open forks at base.—Colorado and Mohave deserts; e. side Sierra Nevada from Inyo Co. to Lassen Co.; n. to Wash., e. to Tex. Apr.-June. Var. PURPÙSII Jepson n. var. Inflorescence denser; calyces smaller; nutlets with narrow wing (one wingless).—Argus Mts. (Purpus 5433, type).

14. **C. crinìta** Greene. Stem rather strictly branched from near base, 7 to 12 in. high; herbage hirsute; the pustulate bases of the hairs giving them a salty appearance; leaves linear, ½ to 1 in. long; spikes elongate, very dense, on very slender peduncles, the shaggy-hirsute covering of the calyces almost concealing the individual flowers; calyx-segments linear, obtuse, in fruit 2½ to 3 lines long; corolla 1½ to 2 lines broad; nutlet solitary, sharply acuminate, with granular brittle pericarp, 1½ lines long, the ventral groove open at the base.—Creek bottoms, 500 ft., Shasta Co. Apr.-May.

15. **C. barbígera** Greene. Stem freely branched from base, ¾ to 1 ft. high; herbage hispid and hirsute; leaves oblong-linear, ½ to 1½ in. long; spikes solitary or paniculate, becoming elongated, the flowers at length remote and less secund; calyx-lobes linear-attenuate, in fruit 3 to 4 lines long, armed with numerous bristles 1½ to 2 lines long and also white-villous; corolla 2 to 3 lines broad; nutlets mostly 1, ovate, acuminate, 1 line long, the grayish-brown surface thickly studded with white papillae, the ventral groove open, dilated at base; gynobase subulate with the infertile ovary-lobes persistent.—Santa Barbara Co.; Colorado and Mohave deserts; Inyo Co.; e. to Utah and Ariz. Apr-May. Var. ÍNOPS (T. Bdg.) Mcbr. Branches slender, terete, divaricate to flexuous.—Colorado and Mohave deserts, n. to Inyo Co. Apr. (Krynitzkia barbigera var. inops Bdg.)

16. **C. glòmeriflòra** Greene. Stem diffusely branching from base, 2 to 4 in. high; herbage hispid; leaves linear-oblong, ¼ to ½ in. long; flowers in glomerules of 2 or 3 at the ends of the branches and in the axils of even the lowest leaves; calyx-segments linear, ½ line long, armed with bristles as long; corolla very minute; nutlets smooth and shining, ovate, acute, the ventral groove open only at base.—Montane 6000 to 10,300 ft.: Sierra Nevada from Nevada Co. to Tulare Co.; White Mts. July.



804. Cryptantha flaccida Greene; *a*, habit x ¼; *b*, fl. x 4; *c*, fr. calyx x 4; *d*, nutlet, dorsal view x 8; *e*, nutlet, ventral view x 8.

17. **C. flàccida** (Dougl.) Greene. Fig. 804. Stem strictly and rigidly erect, with few ascending branches at the top, ¾ to 1¼ ft. high; leaves linear; spikes 2 to 4 in. long, at length not crowded; corolla nearly or quite 1 line broad; fruiting calyx 1½ lines long, appressed to the rachis, its narrowly linear segments thickish at base, connivent above, nearly twice as long as the nutlet, hispid and bearing toward the base a deflexed tuft of bristles; nutlet 1, ovate, rostellate-acuminate at apex, smooth and shining, the groove enlarged below but not forked.—Gravelly hillslopes or valleys, 500 to 4000 ft.: throughout cismontane Cal. Apr.-June.

18. **C. lèiocárpa** (F. & M.) Greene. Stem commonly branched from the base, with many erect or ascending branches, 5 to 18 in. long; branches mostly simple below, branching above, and bearing many spikes which are often more or less congested; herbage hirsute or hispid with spreading hairs; leaves linear, ½ to 1 or 1¾ in. long; spikes leafy-bracted, rarely bractless, the terminal longer and interrupted, the lateral short and glomerate; calyx-lobes short-linear, hispid-bristly, 1 line long; nutlets usually 4, rarely 1, narrowly ovate, acute, ⅔ line long, the ventral groove not forked, or scarcely so.—Sandy lands near the coast: Humboldt Co. to Monterey Co. May-June. Bristles often pustulate-dilated at base. Nutlets mottled transversely on the ventral side and longitudinally on the back. (C. hispidissima Greene.)

19. **C. torrèyana** (Gray) Greene. Stem erect, usually stout, branched from the middle and sometimes from the base; herbage markedly hispid; leaves linear, 1½ to 2¼ in. long; spikes commonly elongated, loose below, frequently geminate; calyx-segments very bristly, elongating in fruit; nutlets ovate, acute, the groove forked at base, the fork sometimes minute.—Hillslopes, 1500 to 5000 ft.: Mt. Hamilton Range; North Coast Ranges; Sierra Nevada from Tehama Co. to Kern Co. Apr.-June. Var. INCÀNA Jepson n. comb. Whole plant gray with dense spreading hispid hairs and (on the stems) finer strigose hairs; calyx elongating less in fruit.—Nine-Mile Creek, Tulare Co. (C. incana Greene.)

20. **C. áffinis** Greene. Stem slender, branching, ½ to 1 ft. high; herbage hispid with rather short hairs; leaves oblong to oblanceolate, ½ to 1¼ in. long, those of the main stem often opposite; spikes simple or in pairs, leafy at base, interrupted; flowers minute; calyx-segments narrowly linear, 1 to 1½ lines long, not elongating in fruit, rather sparsely armed with stiffish bristles; nutlets ovate, acute or acuminate, rounded on the back, smooth and shining, mottled, ¾ line long, attached only up to the middle to the gynobase, the ventral groove closed to base.—Montane, 4000 to 7500 ft.: San Bernardino Mts.; Sierra Nevada from Tulare Co. to Shasta Co.; North Coast Ranges from Lake Co. to Siskiyou Co.; n. to Wash. and Ida. June-July.

14. **ALLOCÀRYA** Greene

Low herbs of wet ground, mostly branching from the base. Leaves linear or narrow, entire, the lowest always opposite. Pedicels persistent. Calyx 5-parted to the base, indurated and somewhat accrescent in fruit. Corolla white with yellow throat, salverform, with short tube; processes or crests

in the throat none or weakly developed. Nutlets ovate or lanceolate-ovate, smooth, rugose, tuberculate or even with barbed or prickly points, often carinate on one or both sides. Scar of the nutlet basal or above the base, concave or sometimes raised and stipe-like. (Greek allos, diverse, and karua, nut, the plants separated from Cryptantha on account of the different fruits.)

A. Perennials; herbage with a dense cover of long soft hairs.

Nutlets gray, rugose, the lateral angles carinate....1. *A. mollis.*
Nutlets brown, reticulate, without lateral carina....2. *A. vestita.*

B. Annuals.

1. Scar basal or very nearly so, not excavate or at least not deeply so.

Nutlets drawn to a lanceolate point above the middle.
  Scar exactly basal; calyx strongly accrescent.
    Stems fistulous-enlarged; nutlets strongly 3-carinate dorsally....3. *A. glabra.*
    Stems not fistulous; nutlets lightly 3-carinate dorsally....4. *A. stipitata.*
  Scar not exactly basal; calyx not accrescent or not markedly so.
    Northern Sierra Nevada....5. *A. ambigens.*
    Mohave Desert....6. *A. cooperi.*
Nutlets ovate or ovoid; scar extending a little way up one side from the base (except in no. 12).
  Keel on ventral side of nutlets lying in a groove.
    Nutlets whitish or light-colored, perfectly smooth and shining...7. *A. lithocarya.*
    Nutlets roughened, drab or brownish....8. *A. chorisiana.*
  Keel on ventral side not lying in a groove or not obviously so.
    Nutlets not bristly.
      Rugae not sharp or dentate.
        Ventral rugae or tuberculations distinct from carina or essentially so.
          Scar linear; nutlets transversely and closely rugulose.9. *A. scalpta.*
          Scar ovate.
            Surface of nutlets more or less reticulate, not tuberculate or scarcely so....10. *A. minuta.*
            Surface of nutlets densely tuberculate....11. *A. diffusa.*
        Ventral rugae or tubercles more or less distinctly merged with carina.. 12. *A. californica.*
      Rugae sharp or dentate or muriculate.
        Scar linear; nutlets of a granitic cast....13. *A. stricta.*
        Scar ovate; nutlets brown....14. *A. trachycarpa.*
    Nutlets microscopically bristly.
      Scar linear; bristles stout....15. *A. hispidula.*
      Scar ovate; bristles very slender....16. *A. humistrata.*

2. Scar distinctly suprabasal, deeply excavate, large, usually half as large as the nutlet; nutlets with bristles or barbed prickles.

Nutlets not rugulose dorsally.
  Bristles scattered over the whole back of the nutlet.
    Bristles very unequal, not barbed....17. *A. spiculifera.*
    Bristles subequal, barbed....18. *A. greenei.*
  Bristles only on the dorsal ridge and marginal angles....19. *A. austinae.*
Nutlets more or less rugulose-areolate, the rugae bearing bristles.
  Rugae high; areoles tuberculate....20. *A. acanthocarpa.*
  Rugae low; areoles smooth....21. *A. scripta.*

1. **A. móllis** (Gray) Greene. Stems 1 to several from the base, spreading or ascending, 2 to 5 in. high; herbage densely clothed with long straight and rather soft hairs even to the calyx; leaves linear-lingulate, obtuse, 1½ to 3¼ in. long; racemes dense, or at length looser, bractless; corolla 2½ to 3 lines broad; nutlets ovate, irregularly rugose or rugose-foveolate, more or less carinate on the back and at the lateral angles, the scar shortly ovate-lanceolate.—Moist alkaline flats and borders of ponds: Sierra Co. to Modoc Co.; n. to eastern Ore.

2. **A. vestita** Greene. Rank plant with ascending stems 1 to 1½ ft. high; herbage conspicuously pilose throughout even to the calyx; spikes 3 to 6 in. long, bractless; flowers about 2 lines broad; fruit not scattered; nutlets brown, nearly 1 line long, regularly reticulate on the back, carinate from the apex to below the middle (the carina there vanishing in the meshes of the reticulation) or not carinate, strongly ridged ventrally down to the roundish scar, which is bounded toward the base by a horseshoe-shaped ridge; epidermal cells microscopically muriculate.—Valley floors: Sonoma Co.; Tulare Co. An unusually localized distribution. (A. mollis var. vestita Jepson.)

3. **A. glàbra** (Gray) Mcbr. Branched from the base, or strictly erect and simple, 5 to 6 in. high; rachis of the spikes fistulous-enlarged, the flowers

rather dense, but strictly unilateral in 2 rather marked rows; calyx-segments spatulate or ovate, very strongly callous-thickened toward the base, the sinus next the axis much deeper than the others, some of the outer sepals united nearly to the summit in some cases; nutlets finely tuberculate, carinate dorsally and with rather sharp lateral angles.—Salt marshes, e. side San Francisco Bay and s. to Santa Clara Co. (A. salina Jepson.)

4. **A. stipitàta** Greene. Branches many from the base, mostly simple, slender, somewhat spreading, commonly 9 to 12 in. long; herbage sparsely setulose; leaves linear-oblanceolate, 1 to 3 in. long, or the basal obovate or oblong, attenuate into a long petiole; pedicels turbinate-thickened beneath the flower; corolla 2 to 3 lines broad, white with yellow eye or the eye changing to white; sepals at length brownish and often spreading, strongly accrescent, becoming 3 to 4 lines long; nutlets obscurely constricted at base, somewhat flattened on the back, rugose and more or less finely tuberculate, strongly carinate ventrally, the dorsal carina obsolete just above the middle.—Plains, very common: inner Coast Range valleys; Great Valley; Sierra Nevada foothills. Apr.-May. Var. MICRÁNTHA Mebr. Corolla 1 to 2 lines broad.—With the species.

5. **A. ámbigens** Piper. Four to 6 in. high; herbage nearly glabrous except on the younger parts; calyx only slightly accrescent; corolla 1½ to 2 lines broad; nutlets as in A. stipitata except that the scar is basally oblique.—Plumas Co.

6. **A. cóoperi** (Gray) Greene. Diffusely branched from the root, 4 to 8 in. high; leaves linear, somewhat succulent, ½ to 1 in. long, the basal 1 to 2½ in.; calyces densely white-hispid; nutlet ovate-trigonous, obcompressed, abruptly contracted above the middle, ventrally reticulate-rugulose, dorsally transversely rugulose, the scar shortly sub-linear.—Mohave Desert; n. to Inyo Co.

7. **A. líthocárya** (Gray) Greene. Stems 7 to 10 in. high; leaves linear, 1 to 1½ in. long; racemes becoming loose and more or less leafy-bracted; nutlets smooth and vitreous-shining, whitish or somewhat mottled, lightly carinate dorsally, the ventral keel hidden by lateral folds for nearly its entire length; scar narrowly linear, likewise hidden by the folds.—Lake and Mendocino Cos.

8. **A. chòrisiàna** (Cham.) Greene. Diffuse (or at first erect) with reclining branches 7 to 16 in. long, strigose throughout and very leafy below; basal leaves linear-elongated, 2 to 4 in. long; racemes elongated, at length very loose, leafy below; fruiting pedicels 3 to 6 lines long, seldom only 1 line long; calyx little accrescent, about 1 line long, the segments at length spreading; corolla 3 to 4 lines wide; nutlets ovate, ½ line long or a trifle more, dark brown, carinate ventrally only, or also dorsally toward the apex, more or less rugulose or minutely tuberculate; ventral carina set in a groove; scar linear.—Low ground towards the coast, sw. Solano Co. to Monterey Co. Apr.-June. Var. MYRIÁNTHA Jepson n. comb. Pedicels nearly all shorter than the calyx; corolla 1 to 1½ (or 2½) lines broad; nutlets brownish, rugulose, minutely tuberculate, carinate half-way down the back.—Monterey coast from Monterey to San Simeon. (A. myriantha Greene.) Var. HICKMÁNNII Jepson n. comb. Like var. myriantha but obscurely tuberculate, scarcely rugulose.—Southern Monterey Co. (A. hickmannii Greene.) Var. UNDULÀTA Jepson n. comb. Nutlets closely rugulose, not tuberculate.—Santa Barbara. (A. undulata Piper.)

9. **A. scálpta** Piper. Stems loosely branched, 5 to 8 in. high; nutlets keeled dorsally only near the apex, closely transverse-rugulose; scar ovate.—Humboldt Co.

10. **A. minùta** Piper. Stems erect, 6 to 10 in. high; nutlets closely reticulate with fine ridges, keeled dorsally near the apex, the surface not tuberculate or scarcely so, scar ovate; epidermal cells microscopically muriculate.—Mendocino and Humboldt Cos. Var. RETÍCULÁTA Jepson n. comb. Nutlet reticulate, the areoles large, smooth; no dorsal keel.—Humboldt Co. (A. reticulata Piper.)

11. **A. diffùsa** Greene. Branches several from the base, decumbent or spreading, 5 to 8 in. long; corolla 1 to 1½ lines broad; nutlet transversely rugulose-reticulate on back and finely tuberculate; scar ovate; epidermal cells microscopically muriculate.—Valleys about San Francisco Bay.

12. **A. califórnica** (F. & M.)Greene. Similar in habit to A. stipitata; flowers 1 to 1½ lines broad; nutlets ovate, carinate ventrally and a little past the apex dorsally, usually grayish, closely rugulose dorsally; scar not raised, nearly basal, ovate or sometimes linear (even on same plant).—Throughout montane Cal., but most common in the North Coast Ranges and n. Sierra foothills.

13. **A. stricta** Greene. Stem slender, strictly erect, commonly branching freely from the base, 6 to 15 in. high; stems and leaves glabrous or nearly so; spikes very dense; corolla 2 lines broad; nutlet keeled to the middle and transversely rugulose dorsally, the rugae sharp, the interspaces very narrow but more or less tuberculate; scar linear.—Upper Napa Valley.

14. **A. tràchycárpa** (Gray) Greene. More or less diffuse or decumbent; racemes leafy throughout or nearly so; calyx-segments spreading; corolla small, 1 to 1½ lines broad; nutlets broadly ovate, transversely and sharply rugose and papillate or muricate, carinate ventrally and dorsally; dorsal rugosities commonly simple, and keel mostly dentate-interrupted; scar deltoid-orbicular, nearly basal.—Sacramento and San Joaquin valleys and w. to Sonoma and Monterey Cos.

15. **A. hispídula** Greene. Spreading, 2 to 6 in. high; herbage hirsutulose; nutlet finely tuberculate, rugulose-reticulate, microscopically bristly on the ridges, carinate ventrally; scar linear, not excavated; bristles more or less barbed at tip.—Montane, 5000 to 8000 ft.: Sierra Nevada; San Bernardino Mts. Var. PÉNICILLÀTA Jepson n. comb. Nutlets with the barbed bristles tufted, especially on the tubercles; scar excavated.—Sierra Nevada, 5000 to 8700 ft. (A. penicillata Greene.)

16. **A. humistràta** Greene. Branches stoutish, mostly prostrate, 6 to 12 in. long; pedicels short and stout, commonly deflexed; calyx markedly accrescent, in fruit 4 to 6 lines long; nutlets muriculate and sharply rugulose, bearing minute penicillate bristles; scar roundish, exactly basal.—San Diego and n. to the San Joaquin Valley. Var. SÍMILIS Jepson n. var. Scar ovate, oblique at the base.—E. Contra Costa Co. (Antioch, K. Brandegee, type).

17. **A. spiculífera** Piper. Branches spreading, 4 to 8 in. long; nutlet covered with short spines which arise from the dorsal keel and from low reticulations, some of the spines barbed at tip; scar deltoid, bordered by a flange-like margin.—Tulare Co. plains.

18. **A. greénei** (Gray) Greene. Diffusely branched from the base, the straggling branches 5 to 15 in. long; herbage strigulose-pubescent; leaves linear-oblanceolate; racemes simple, leafy or bracteate below, the flowers scattered; nutlets broadly ovate, 1 line long, carinate, densely and minutely tuberculate and well armed with slender barbed prickles; prickles ¼ to ½ line long, quite distinct at base.—Grassy clay hills or adobe plains, northern Sierra foothills from Calaveras Co. to Siskiyou Co.; n. to Ore. Var. HYSTRÍCULA Jepson n. comb. Bristles very short (about ⅙ the length of the nutlet), densely barbed throughout, disposed in rows, either crowded or interrupted, but so arranged as to make the surface somewhat areolate; areoles covered with fine tubercles.—Low plains, Solano Co. (A. hystricula Piper.)

19. **A. austìnae** Greene. Erect, 6 to 9 in. high; herbage almost glabrous; leaves linear, 1½ to 3 in. long; surface of nutlet densely tuberculate, the dorsal keel and lateral angles armed with stout bristles; bristles barbed from midway up.—N. Sierra Nevada foothills and bordering plains from Amador Co. to Shasta Co. Var. CRISTÁTA Jepson n. comb. Surface of nutlet not tuberculate.—Calaveras Co. (A. cristata Piper.)

20. **A. acánthocárpa** Piper. Branches several from the base, simple, 4 to 6 in. high; corolla ¾ line wide; keel and ridges of the lateral reticulations armed with bristles; interspaces tuberculate.—San Joaquin Valley in Kern Co. Var. ECHINÀCEA Jepson n. comb. Reticulations of the nutlet small; bristles of the nutlet very numerous.—Great Valley and South Coast Ranges

to San Diego Co. (A. echinacea Piper.) Var. ÓLIGOCHAÈTA Jepson n. comb. Bristles very few.—E. Contra Costa Co. (A. oligochaeta Piper.)

21. **A. scrípta** Greene. Branches prostrate, 6 to 10 in. long; back of the nutlets smooth and brown, except as marked by sharp white-reticulated ridges, these irregularly beset with tufts of spreading bristles.—Sacramento Valley.

15. ECHÍDIOCÀRYA Gray

Annual herbs with the lower leaves opposite. Flowers in racemes. Nutlets strongly incurved, dorsally rugose; scar elevated on a conspicuous slender projection or stipe. Ventral keel prominent, continuous downward and joined to the base of the stipe. (Greek echidion, a diminutive viper, and carua, nutlet, the stipe suggestive of the head and neck of a snake.)

1. **E. califórnica** Gray. Stems several or numerous from the base, diffuse or prostrate, mostly slender, often very leafy, 5 to 14 in. long, flowering for ⅔ or more of their length; herbage hispid or hirsute; leaves linear; racemes spike-like, mostly bractless, in age remotely flowered; calyx cleft nearly to the base; corolla 1½ to 3 lines wide; nutlets usually 4, ovate, ¾ line long, the median dorsal ridge well-marked towards apex, the ridges of the lateral angles not conspicuous and blending with the transverse ridges of the back which connect to form polygonal areas.—Mesas, 100 to 1500 ft., coastal S. Cal. from the Santa Inez Mts. to San Diego Co. Var. URSÌNA Jepson n. comb. Stems stout, short, depressed; nutlets about 1 line long, the dorsal ridges few.—Summit valleys, San Bernardino Mts. (Plagiobothrys ursinus Gray.)

16. PLÀGIOBÓTHRYS F. & M. Pop-corn Flower

Rather slender annuals. Herbage soft-pubescent, the hairs often rusty when young, especially on the calyx. Leaves alternate, mostly in a basal rosette. Flowers in spike-like, elongated, loose and sometimes leafy racemes or sometimes glomerate. Pedicels very short or almost none, filiform, persistent. Corolla short, white, with crests or processes at the mouth of the throat. Nutlets ovate, carinate on both sides towards the apex and often also laterally margined, on the back rugose or roughened; insertion above the base or median, the scar raised and rounded and leaving a corresponding depression on the receptacle or gynobase. (Greek plagios, on the side, and bothrus, pit or excavation, the first known species having a hollow scar.)

Caruncle rounded or circular in outline; nutlets ovate or cruciform.
- Flowers in an elongated raceme; caruncle firm or cartilaginous, borne at or a little below the middle of the nutlet in a transverse groove and thus lying below the ventral keel; basal rosette of leaves conspicuous; mature nutlets 1 to 4.
  - Calyx-lobes erect or spreading, not circumscissile; mature nutlets usually 4.
    - Nutlets with the back marked off by transverse lineate grooves into broad flattish ridges.
      - Plants conspicuously purplish; nutlets ovate, constricted only at apex, the base rounded, dark-colored.....1. *P. torreyi.*
      - Plants not purplish or rarely so; nutlets strongly constricted at apex and at base, and thus cruciform, vitreous-shining or glassy.
        - Calyx about twice as wide as long; racemes not bracteate or only at base; stems many from base, slender...2. *P. tenellus.*
        - Calyx nearly as broad as long; racemes bracteate; stems few, stout.....3. *P. shastensis.*
    - Nutlets with transverse dorsal ridges very thin and sharp, the ridges rather widely separated, so that, with the 3 keels, there are enclosed depressed rectangular areas with granulate surface.
      - Caruncle conspicuous, ring-like or annular; calyx cleft to the base; corolla-tube exceeding the calyx; var. campestris of.....4. *P. fulvus.*
      - Caruncle solid; calyx cleft ⅔ to base; corolla-tube not exserted from calyx.....5. *P. canescens.*
  - Calyx-lobes connivent over fruit, in age circumscissile; mature nutlets 1 or 2.
    - Flowers in forked racemes, not bracteate or only at base; stems mostly erect, rather tall (10 to 30 in. high); nutlets, in lateral outline, compressed.....6. *P. nothofulvus.*
    - Flowers in a long simple bracteate raceme; stems low (5 to 8 in. high), usually ascending, branched mainly below the middle; nutlets, in lateral outline, strongly arched.....7. *P. arizonicus.*
- Flowers in a close cluster or glomerule; e. side Sierra Nevada.....8. *P. hispidus.*

Caruncle elongated, extending along the median ventral keel; nutlets trigonous; deserts on e. side Sierra Nevada.

Nutlets irregularly rugose; corolla 2 to 3½ lines broad; flowers in a congested cluster or glomerule; var. harknessii of.....9. *P. kingii.*
Nutlets regularly tesselate; corolla ½ to 1 line broad.....10. *P. jonesii.*

1. **P. tórreyi** Gray. Fig. 805. Stems several to many from the base, erect or decumbent, commonly simple, 2 to 6 in. long, commonly rather densely leafy throughout; roots purple; herbage very dark green, conspicuously hispid; leaves oblong to oblong-ovate or linear, sessile, 5 to 10 lines long; racemes leafy-bracteate throughout, somewhat loose; calyx cleft nearly to base; corolla 1 to 1½ lines broad; nutlets commonly 4, ovate, dull or gray, somewhat constricted at apex, rounded at base, ¾ to 1 line long, the dorsal ridge weak, produced around apex into the narrow and very prominent ventral keel; lateral angles well-defined, the back with transverse lineate grooves, thus separating the dorsal area into low ridges; caruncle small, sunken in the transverse groove. — Montane, 4000 to 8000 ft.: Sierra Nevada from Nevada Co. to Tulare Co. Var. DIFFÙSUS Jtn. Stems diffusely spreading, more leafy; bracts larger; flowers more numerous.—Sierra Nevada.

805. Plagiobothrys torreyi Gray; *a*, habit x ½; *b*, fl. x 4; *c*, corolla spread open x 3; *d*, nutlet x 8.

2. **P. tenéllus** Gray. Stems 1 to several from the base, commonly erect, simple or branching above, 3 to 7 (or 12) in. high; herbage pubescent or often hirsute with spreading hairs; leaves of the basal tuft oblong, acute or obtuse, ½ to 1 in. long; cauline leaves few, ovate or ovate-oblong, 2 to 6 lines long; spikes 1 to 3 in. long, comparatively few-flowered; calyx deeply cleft, at first rusty-yellowish, at length pale, sometimes imperfectly circumscissile; nutlets minute (¼ line long), shining and enamel-like on the back, papillate-scabrous on the lateral angles and often also on the rugae; rugae transverse, straight, smooth and low, separated by very fine lines.—Hill slopes, 100 to 2000 (or 3000) ft.: Coast Ranges; Sierra Nevada foothills; coastal S. Cal. May.

3. **P. shasténsis** Greene. Stems erect, stoutish, one or few from the base, simple or branching above, 5 to 12 in. high; herbage thinly hirsute; leaves linear; racemes loose; calyx 2 to 2¾ lines broad, scarcely longer, cleft to the middle; corolla 1¼ lines broad; nutlets glassy, transversely lineate-grooved with broad flat ridges between the grooves.—Hillslopes and valleys, 500 to 2500 ft.: e. San Joaquin Co. to Butte Co.; Lake Co. to Siskiyou Co.; n. to southern Ore.

4. **P. fúlvus** (H. & A.) Jtn. var. **campéstris** (Greene) Jtn. Stems 1 or several from the base, erect or simple or branching only above, 1 to 2 ft. high; herbage hispid-hirsute; roots, petioles and midribs of leaves purple-dyed; herbage hirsute; leaves linear or lanceolate, ½ to 3¼ in. long; racemes very loose and leafless; calyx-segments nearly distinct, lanceolate, connivent over the nutlets, more or less reddish even in age, 2 to 3 lines long in fruit; corolla 1 to 2 lines broad; nutlets usually 4, 1½ lines long, nearly 1 line wide in the middle, abruptly beaked, the transverse rugae more or less interrupted and often dot-like or granulate; median and lateral ridges prominent; caruncle raised and ring-like, bordering a deep circular excavation.—Plains and foothills, 100 to 1500 ft.: Sacramento Valley and its bordering foothills; s. to Mariposa, Santa Clara and San Luis Opisbo Cos. Apr.-May. (P. rufescens var. campestris Jepson.)

5. **P. canéscens** Benth. Stem divided at or near the base into long and straggling branches, rarely erect, the branches nearly or quite simple, ½ to 2 ft. long, loosely flower-bearing and leafy nearly throughout, or quite leafless above and spicate; herbage pale, hirsute; leaves oblong to linear, lanceolate or oblanceolate, ¾ to 2½ in. long; calyx cleft to below the middle, the segments broadly lanceolate, in fruit circular-depressed, 2 to 3 lines long, the tips of the segments connivent over the nutlets; pedicels short, stubby, persistent, the calyx in age deciduous; nutlets commonly 4, incurved-connivent, rugose-reticulate, light gray, 1 line long, the areola smooth, longer transversely, and the lateral angles very distinct.—Low open hills and rolling plains, 100 to 1500 ft.: Sacramento and San Joaquin valleys and their bordering foothills; s. to San Diego Co. Apr. Var. APÉRTUS Greene. Calyx-segments stellately spreading; caruncle green, a small hollow like a pin point on the upper part of it.—Alameda and Santa Clara Cos. to San Diego Co.; also Great Valley. Var. CÁTALINÉNSIS Jepson n. comb. Herbage purple-stained; nutlets commonly 2.—Santa Catalina Isl. (P. arizonicus var. catalinensis Gray.)

6. **P. nothofúlvus** Gray. Stems slender, 1 to several from the base, erect or suberect, simple or forked only above, 1 to 2½ ft. high; roots, petioles and midribs of leaves purple-dyed; herbage silky-villous, the hairs very reddish when young, especially on the calyx and sometimes on the leaves; raceme forked once, twice or more, the inflorescence then paniculate, leafless or bracted only at base; leaves 1 to 3½ in. long, oblong-ovate or lanceolate, those of the basal tuft oblong-ovate or oblanceolate; calyx cleft to the middle, 1½ lines long, in fruit circumscissile below the middle, the upper part falling away and leaving the persistent base as a shallow cup about the nutlets; corolla 2 to 4 lines broad; nutlets 3 (sometimes 4, 1 or 2), ovate, narrowed to a stout apical beak, flat dorsally, dull; transverse ridges joining the median dorsal keel with the lateral keels complete (and thus making rectangular areoles) or incomplete; caruncle situated in the shallow transverse groove.—Foothills and valleys, 100 to 3100 ft.: Sierra Nevada foothills (common); Coast Ranges (frequent but usually not on the immediate coast); Great Valley (infrequent); s. to San Diego Co.; n. to Wash. Mar.-May.

7. **P. arizònicus** (Gray) Greene. Stems several from the base, usually simple, erect or ascending, 8 to 15 in. high; herbage hispid with spreading hairs; leaves linear-lanceolate to linear; roots, midribs and margins of leaves purple, or occasionally the whole plant purplish; racemes elongated, remotely flowered, mostly naked above; calyx cleft nearly half-way to base, the oblong lobes connivent over the fruit, the lower portion at length circumscissile near base; corolla 1 to 1¼ lines broad; nutlets 2 (sometimes 1, 3 or 4), ovate, light colored, abruptly narrowed to a stout beak, ¾ to 1¼ lines long; dorsal keel narrow, sharp; transverse ridges parallel, setting off rectangular areoles; caruncle seated in a transverse groove and thus sunken below the crest of the ventral keel.—Mts. on w. side Colorado Desert; w. side Mohave Desert; mts. on w. side upper San Joaquin Valley; Inyo Co.; e. to N. Mex. and southern Utah.

8. **P. híspidus** Gray. Stem erect, much-branched, 6 in. high; herbage roughly hispid; leaves linear-spatulate, the upper oblong; flowers in close clusters or glomerules; nutlets ovoid, acute, obscurely carinate on back, not rugose or muricate, but papillate-granulate; caruncle small, soft or fragile.—East side Sierra Nevada from Mono Co. to Lassen Co., thence nw. to Siskiyou Co.; w. Nev. to cent. Ore.

9. **P. kíngii** (Wats.) Gray var. **harknéssii** Jepson n. comb. Stem erect, branched, 4 to 8 in. high; herbage coarsely hirsute with spreading hairs; basal leaves spatulate, 1 to 2 in. long, the upper oblong or lanceolate about ½ in. long; flowers glomerate or becoming somewhat racemosely elongated; corolla 3 to 4 lines broad; nutlets interruptedly rugose or papillate.—E. side Sierra Nevada: Inyo Co.; Mono Lake; n. to eastern Ore. (Sonnea harknessii Greene.)

10. **P. jònesii** Gray. Stems few or several from the base, divergently branching, 5 to 8 in. high; herbage with spreading bristly hairs and also

finely pubescent with short mostly deflexed hairs; bristles mostly arising from a siliceous base or disk; leaves narrowly lanceolate, ½ to 1 in. long, or the basal linear-oblanceolate, 1 to 1¾ in. long; calyx-segments linear, long-bristly, as well as with a shorter pubescence; corolla ½ to 1 line broad; nutlets 1½ lines long, strongly ridged dorsally and also with ridges at the lateral angles, the surface densely covered with flattened papillae, that is, tessellate; ventral keel well developed, merged below with the low narrow caruncle.—Desert valleys and cañons, 500 to 4000 ft.: Hanaupah Cañon, Panamint Mts.; Needles.

17. **HÁRPAGONÉLLA** Gray

Small annual. Flowers minute, white, somewhat racemosely disposed at the ends of the branches. Calyx-lobes rather closely beset with soft hooked spines, in fruit very unequal, 3 nearly distinct, the other 2 more united and forming a bur-like envelope enclosing the 1 or 2 nutlets which are basally attached. (Diminutive of Latin harpago, a grappling-hook.)

1. **H. pálmeri** Gray. Stem diffusely branched from the base, the branches 3 to 8 in. long; herbage thinly strigose-hirsute; leaves narrowly linear or very narrowly lanceolate, ½ to 1½ in. long; flowers 1 line long, on short pedicels which in fruit become strongly recurved and rigid; nutlets 1 or 2, smooth.—Dry slopes and mesas, 200 to 1500 ft., coastal S. Cal.: Santa Catalina Isl.; Murietta, w. Riverside Co.; El Cajon; San Diego; e. to Ariz.

Lycópsis L. Coarse setose-hispid annuals with small flowers and leafy bracts. Corolla with unequal lobes, the tube curved at the middle, the throat closed with hispid scales. Nutlets ovoid, coarsely reticulate-rugose; scar large, oval, excavated or perforate, bordered by a thickened cartilaginous ring. L. ARVÉNSIS L. Small Bugloss. Stems 1 to 2 ft. high, the spreading bristly hairs at length pustulate at base; leaves lanceolate, undulate-margined; flowers more or less racemose; corolla blue or at first purple, the tube not longer than the calyx, the lobes barely 1 line long.—Native of Eur.; adv. at Upland, San Bernardino Valley.

Sýmphytum L. Coarse perennial herbs with entire leaves. Flowers in forked scorpioid racemes. Corolla in ours purple, tubular, shallowly 5-lobed, its throat with 5 prominent lanceolate crests alternating with and as long as the stamens. Stamens included; style exserted. Nutlets 4, inserted by their bases. S. ASPÉRRIMUM Donn. Rough Comfrey. Stems 2 to 3 ft. high; herbage scabrous-hairy; leaves ovate- to oblong-lanceolate, acuminate, 4 to 7 in. long; flowers 7 lines long.—Native of Eur.: adv. at Arcata.

VERBENÀCEAE. VERBENA FAMILY

Ours herbs with opposite or whorled simple leaves. Flowers complete. Calyx persistent. Corolla in ours with a tube, the 4 or 5-lobed limb almost regular or manifestly 2-lipped. Stamens 4, in 2 pairs. Ovary superior, undivided, 2 to 4-celled, separating at maturity into as many 1-celled 1-seeded achene-like nutlets; style single, entire; stigmas 2 or 1. Nutlets usually rounded and often reticulate on back, the face with a commissural scar or area of coherence. Endosperm scanty or none.

Calyx 5-toothed; nutlets 4; diffuse or erect herbs.....1. VERBENA.
Calyx 2-cleft; nutlets 2; creeping herbs.....2. LIPPIA.

1. **VERBÈNA** L. VERVAIN

Erect or diffuse herbs. Flowers in terminal dense bracteate spikes. Calyx narrow, tubular, plicately 5-angled, 5-toothed. Corolla salverform, the limb 5-lobed, obscurely or slightly 2-lipped. Anthers ovate. Stigmas mostly 2-lobed, the anterior lobe larger and stigmatic, the posterior smooth and sterile. Fruit mostly enclosed by the calyx, finally separating into 4 nutlets. (Latin name of a sacred plant.)

Flowers in spikes; corolla 1½ to 2 lines long, its limb about 1 line broad; corolla-lobes not obcordate.
Bracts shorter than the flowers.
Spikes filiform, the flowers or fruit scattered.
Annual; leaves 1 to 2-pinnately cleft or incised.....1. *V. officinalis.*

Perennial; leaves merely serrate or sparingly incised.
Leaves petioled.....2. *V. urticifolia.*
Leaves sessile or nearly so.....3. *V. polystachya.*
Spikes densely flowered, at least above; perennial.
Petioles naked; spikes sessile or leafy-bracted at base.....4. *V. hastata.*
Petioles cuneately margined; spikes peduncled.
Spikes at length 4 to 12 in. long, 1½ to 3 lines wide, loosely paniculate.....5. *V. prostrata.*
Spikes 1 to 2 in. long, only slightly elongating, 3 to 5 lines wide, borne in a strict compact panicle; flowers dense.....
6. *V. robusta.*
Bracts exceeding or at least equaling the flowers; spikes thick and dense.....
7. *V. bracteosa.*
Flowers in a head or at most an oblong spike; corolla 4 to 5 lines long, its limb 3 to 5 lines broad; corolla-lobes obcordate; annual.....8. *V. bipinnatifida.*

1. **V. officinàlis** L. HERB-OF-THE-CROSS. Stem erect, diffusely branched above, 1 to 3 ft. high, glabrous or nearly so; leaves obovate or ovate, deeply incised or pinnatifid to bipinnatifid, 1 to 1½ in. long, narrowed into short margined petioles, the upper leaves lanceolate, incised or serrate, or entire, sessile, all minutely pubescent; bracts ovate, acuminate; corolla white or purplish, the limb 1 to 2 lines broad.—Native of Eur., adv. in S. Cal.: San Diego; Oneonta; Riverside; Indian Wells, Colorado Desert.

2. **V. urticifòlia** L. NETTLE-LEAF VERVAIN. Erect, 1 to 3 ft. high, scabrous; leaves ovate to oblong-lanceolate, acute, serrate, 1 to 3 in. long, on petioles 4 to 7 lines long; spikes elongated, very slender, the fruits somewhat scattered; bracts ovate, acuminate, ⅓ to ⅔ as long as calyx; corolla white or purplish; commissure of nutlets sprinkled with irregular white-waxy granules. — Marshes: Los Angeles; San Bernardino; e. to the Atlantic, s. to trop. Am.

806. Verbena hastata L.; *a*, leaf x ⅓; *b*, infl. x ⅓; *c*, fl. x 2; *d*, nutlet x 4.

3. **V. polystàchya** H.B.K. Near no. 2; hirsute-pubescent; leaves oblong to ovate-lanceolate, serrate or sparingly incised, 1 to 2 in. long, sessile by a broad base or very sharply petioled; spikes denser than in preceding. — Marshy or moist places in the foothills, infrequent: San Gabriel Mts.; San Bernardino Mts.; s. to Mex.

4. **V. hastàta** L. BLUE VERVAIN. Fig. 806. Stem erect, strict, 2 to 5 ft. high; herbage short-hispid; leaves oblong-lanceolate, gradually acuminate, rather finely serrate, 3 to 6 in. long, on petioles ½ in. long; some of the lower leaves commonly hastately lobed at base; spikes not leafy at base, more or less peduncled, densely flowered, 2 to 3 in. long, erect and numerous in a close panicle; corolla deep blue; nutlets with smooth commissure.—Islands of the lower Sacramento River; n. to B. C., e. to the Atlantic.

5. **V. prostràta** R. Br. COMMON VERVAIN. Fig. 807. Stem diffusely branched or spreading, 1 to 4 ft. high; herbage mostly soft-pubescent; leaves broadly ovate or oblong-ovate, coarsely serrate, and often laciniately lobed, especially toward the base which is contracted into the cuneately winged petiole, 2 to 4 in. long; lower leaves commonly 3-parted or -divided; spikes 2 to 12 in. long, solitary, or more commonly loosely paniculate; bracts subulate, shorter than the calyx; corolla violet or blue; commissure of nutlets muriculate-scaberulous.—Dry open hill country: cismontane Cal. from San Diego Co. to Siskiyou Co.; n. to southern Ore. July-Sept.

6. **V. robústa** Greene. Similar to no. 5; stem strictly erect, paniculately branched above, 2 to 2¾ ft. high; leaves irregularly incised or cleft (but commonly not divided), harshly pubescent; inflorescence rather leafy; spikes dense, 1 to 2 in. long, 3 lines broad; corolla 2½ to 3 lines long, its limb 1 line broad, its tube hairy inside.—Cañons about San Francisco Bay, 50 to 600 ft.: Tiburon; Wildcat Creek, Berkeley.

7. **V. bracteòsa** Michx. Diffusely much branched, ½ to 1½ ft. high, hispidulose throughout; leaves obovate or oblong, pinnately incised or coarsely serrate, narrowed at base into a cuneately winged petiole, ¾ to 2 in. long; spikes commonly dense; bracts lanceolate, carinate-ribbed, rigid, exceeding the flowers; corolla blue; commissure of nutlets muriculate-scabrous. — Open ground: Inglewood, Los Angeles Co.; San Bernardino; lower San Joaquin River (perhaps an immigrant); n. to B. C.; e. to the Mississippi Valley.

807. Verbena prostrata R. Br.; *a*, spike; *b*, leaf. x ⅔.

8. **V. bipinnatífida** Nutt. Stems several from the base, ascending, 5 to 15 in. long; herbage hirsute-pubescent; leaves roundish in outline, palmately 3-parted, the divisions pinnately cleft into oblong lobes, ½ to 1¾ in. long, on petioles ½ to as long; spikes short or capitate, dense, ½ to 1¼ in. long; bracts usually rather shorter than calyx; calyx-teeth obtuse, becoming tightly plicate about the prominent midrib so as to appear acute-subulate; corolla-lobes usually obcordate; scar of nutlets narrow, running nearly to apex, ornamented with a white band of retrorse hispidulose hairs.—Desert region, 2000 to 4000 ft.: Barstow; Cima; Providence Mts.; New York Mts.; e. to southern Nev. and Ark., s. to Mex. May.

808. Lippia nodiflora Michx.; *a*, habit x ½; *b*, fl. x 3; *c*, long. sect. of corolla x 3; *d*, pistil x 6; *e*, nutlet x 3.

2. LÍPPIA L. Lemon Verbena

Ours prostrate perennial herbs. Flowers on slender axillary peduncles, disposed in short spikes or heads and subtended by broad closely imbricated bracts. Pubescence fine, the hairs fixed by the middle and both ends acute. Calyx small and short, in ours 2-cleft, the lobes entire and lateral. Corolla-tube cylindric, the limb manifestly bilabiate, the upper lip retuse or emarginate, the lower lip 3-cleft. Style mostly short; stigma thickish, oblique. Fruit with more or less corky pericarp, not readily separating into the 2 nutlets. (Dr. A. Lippi, a French naturalist, killed in Abyssinia in 1703.)

Leaves thickish, oblanceolate or obovate.. 1. *L. nodiflora.*
Leaves thinnish, ovate...2. *L. lanceolata.*

1. **L. nodiflòra** Michx. Mat-grass. Fig. 808. Stems extensively creeping from a lignescent perennial base; herbage minutely canescent; leaves thickish, cuneate-oblanceolate or -obovate, sharply serrate

towards the apex, sessile or shortly petioled, 5 to 10 lines long; peduncles filiform, 1 to 4 in. long, much exceeding the leaves; heads cylindraceous in age, 3 to 3½ lines thick; calyx with 2 low triangular teeth, these laterally disposed and entire or notched; corolla white, 1½ lines broad; fruit globose or didymous.—Lower Sacramento and San Joaquin rivers, especially on river banks; e. to the Atlantic. It is esteemed as a plant covering on levees for the purpose of resisting erosion. July-Sept.

2. **L. lanceolàta** Michx. Similar to the preceding, but greener; leaves thinner, ¾ to 2½ in. long, ovate, pinnately straight-veined, sharply serrate except at the broadly cuneate base which is abruptly narrowed to a short petiole; peduncles often shorter than the leaves; corolla bluish white.—River banks and moist bottoms: Great Valley to S. Cal.; e. to the Atlantic.

LABIÀTAE. Mint Family

Aromatic herbs or low shrubs with square stems and always opposite simple leaves. Flowers perfect, solitary in the axils or more commonly in small cymes; cymes sessile in the axils of the opposite leaves (rarely peduncled), commonly dense and having the appearance of a whorl, and thus denominated in the descriptions. Subtending leaves of the whorls frequently bract-like and the internodes short, the inflorescence thus becoming spike-like, or the whorl sometimes terminal and head-like. Calyx always synsepalous, frequently 2-lipped, usually 5-toothed. Corolla with a distinct tube, 2-lipped, commonly with 2 lobes in the upper lip and 3 lobes in the lower lip; or the lips sometimes subequal and the lobes regular or nearly so. Stamens inserted on tube of corolla, 4, in 2 pairs, or the upper pair of stamens wanting or represented by sterile filaments. Ovary superior, 4-lobed (or 4-parted in Trichostema), separating when ripe into 4 small 1-seeded smooth nutlets. Style single, commonly situated in the depression among the lobes of the ovary, cleft at apex.

A. Ovary 4-lobed, the style not basal; nutlets attached by the side.

Corolla-limb very irregular, apparently 1-lipped; stamens exserted.....1. Teucrium.
Corolla-limb nearly equally 5-lobed, the lobes turned downward; stamens long-exserted...
2. Trichostema.

B. Ovary deeply 4-parted, the style basal; nutlets attached by the base.

I. Calyx 2-lipped, the lips entire.

Calyx with a gibbous or helmet-shaped protuberance on the back; flowers solitary in the axils of the opposite leaves; herbs.....3. Scutellaria.
Calyx not gibbous on the back, bladdery-inflated in fruit; flowers in a loose spike; shrub..
4. Salazaria.

II. Calyx regular, or 2-lipped, the lips not entire.

1. Corolla markedly 2-lipped.

Calyx with 10 spinescent teeth hooked at tip; stamens included in the corolla-tube.....
5. Marrubium.
Calyx-teeth not hooked at tip; stamens not included in tube, exserted from corolla or included in throat.
Upper pair of stamens longer than the lower.
Stamens exserted; anther-cells parallel; stems glabrous.....6. Agastache.
Stamens not exserted; anther-cells divergent; stems canescent above..7. Nepeta.
Lower pair of stamens longer than the upper or equaling them.
Calyx 2-lipped or with unequal teeth.
Upper calyx-lip truncate, its margin with 3 cusps, the lower-lip 2-cleft; flowers in a dense spike; herb.....8. Brunella.
Upper calyx-lip not truncate.
Anthers 1-celled; stamens with anthers 2; filament bearing a linear connective, or jointed, or sometimes simple; shrubs or herbs.
9. Salvia.
Anthers 2-celled.
Corolla-tube with a hairy ring within; anther-bearing stamens 4; flowers in loose axillary clusters; herbs....10. Melissa.
Corolla-tube with no hairy ring within.
Bracts orbicular or elliptic-ovate, with about 7 to 10 prominent spines on the margin; corolla white; anther-bearing stamens commonly 2; annuals.....
11. Acanthomintha.
Bracts lanceolate or oblanceolate, the margin ciliate or merely pubescent, not spiny.
Herbs; corolla usually exceeding calyx.

Style hairy, sometimes very scantily so; corolla blue or purple; bracts and calyx markedly ciliate; annuals.....12. POGOGYNE.
Style not hairy; corolla crimson; bracts and calyx soft-hairy; perennial herbs.....
13. CLINOPODIUM.
Woody-based plants (ours); corolla white, scarcely exceeding calyx; style hairy.....14. SATUREIA.
Calyx-teeth equal or nearly so; stamens 4.
Flowers solitary.
Trailing evergreen, herb-like; corolla-tube with no hairy ring within...
15. MICROMERIA.
Erect shrub; corolla-tube with hairy ring within.....16. SPHACELE.
Flowers several in axils of floral leaves or in dense whorls, usually forming an interrupted spike-like inflorescence; herbs except no. 20.
Corolla-tube with hairy ring within; calyx-teeth spine-tipped.....
17. STACHYS.
Corolla-tube with no hairy ring within; calyx-teeth not spine-tipped.
Filaments glabrous; lower lip of corolla not saccate.
Corolla white; anthers glabrous; leaves sessile; perennial herbs.....18. PYCNANTHEMUM.
Corolla purplish-red; anthers hairy; leaves petioled; annuals.
19. LAMIUM.
Filaments, at least the upper, hairy; lower lip of corolla with the middle lobe saccate or deeply bowl-shaped; shrubs.....
20. HYPTIS.

2. Corolla regular or nearly so, or the lobes subequal; herbs.

Flowers in terminal heads; stamens 4; dry hills or valleys or rocky mountain slopes.....
21. MONARDELLA.
Flowers in axillary whorls; marshes, river bottoms or wet flats.
Stamens 2.....22. LYCOPUS.
Stamens 4.....23. MENTHA.

1. TEÙCRIUM L. GERMANDER

Ours herbs with the flowers in spike-like racemes. Calyx 5-parted. Corolla very irregular, seemingly 1-lipped; upper lip deeply cleft between its lobes, these partly united one on each side to the lateral lobes of the declined lower lip, so that the whole appears as if pinnately 5-cleft with the terminal lobe much the larger. Stamens 4, exserted and ascending from the cleft of the upper lip, the lower pair longer than the upper. Anthers confluently 1-celled. Nutlets with broad areolae. (Teucer, King of Troy.)

1. **T. cubénse** L. var. **dénsum** Jepson n. var. Annual, stems many from the base, ascending, ¾ to 1 ft. high, glabrous or nearly so; leaves obovate-cuneate, crenately incised and sometimes 3-parted, petioled, ¾ to 1¼ in. long; racemes dense and regular, spike-like, the flowers solitary in the axils of and about equaling the palmately 3-divided bracts; corolla pale blue or whitish, marked with a few purple dots, slightly hairy inside on palate, 3 to 4 lines long, little exceeding the calyx; nutlets somewhat corky, obscurely few-ribbed lengthwise.—Colorado River bottoms (Palo Verde Valley, Jepson 5258, type). Resembles Verbena bracteosa in habit.

2. TRICHOSTÈMA L. BLUE CURLS

Ours ill-scented herbs with entire leaves and blue (occasionally pinkish or whitish) flowers in axillary cymes or becoming raceme-like in age. Calyx equally or almost equally 5-cleft. Corolla with oblique limb, the oblong lobes nearly alike; tube in ours slender, often far exceeding the calyx and abruptly geniculate or curved into an arc of a circle just below the limb. Stamens 4, with the anther-cells divaricate; filaments capillary, blue or violet, spirally coiled in the bud, in anthesis very much exserted, ascending between the deeply parted upper lobes of the corolla and curved outward and downward. Nutlets rugose-reticulate. (Greek trichos, hair, and stemon, stamen.)

Corolla 1 to 3 lines long, the tube not exserted; annuals.
Herbage cinereous-pubescent; leaves lanceolate, not costate-veined; corolla 1 line long.
1. *T. micranthum.*
Herbage soft-villous or glandular-villous; leaves oblong to oval or ovate-lanceolate, costate-veined; corolla 2 to 3 lines long.
Soft-villous, seldom glandular; leaves oblong to oval; calyx-lobes narrow; corolla 3 lines long.....2. *T. oblongum.*
Glandular-villous; leaves ovate-lanceolate; calyx-lobes broad; corolla 2 lines long.
3. *T. simulatum.*

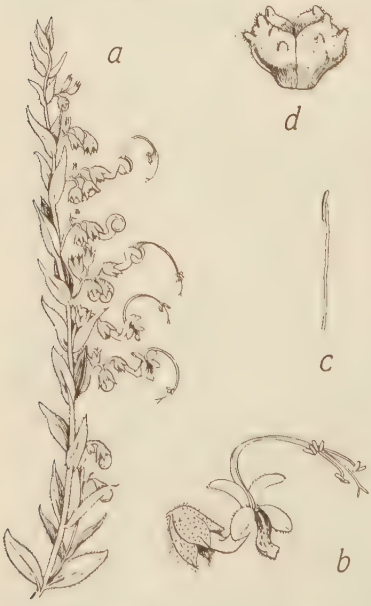
Corolla about 3 to 6 lines long, the tube exserted.
Annuals; stems ¾ to 2 ft. high, leafy to the summit; corolla 3 to 5 lines long.
Diffusely branched, rather sparsely leafy; leaves petioled; cymes loose..... 4. *T. laxum.*
More strict and simple, densely leafy; leaves sessile or subsessile; cymes dense.
Corolla 5 lines long; leaves ovate-lanceolate..... 5. *T. lanceolatum.*
Corolla 3 lines long; leaves short-ovate..... 6. *T. ovatum.*
Perennial, shrubby at base; stems 2 to 3 ft. high, leafless above; corolla 9 lines long.. 7. *T. lanatum.*

1. **T. micránthum** Gray. Stem simple or branched from the base, 3 to 9 in. high, leafy to the summit; herbage ashy-pubescent, somewhat glandular; leaves lanceolate, not costate-veined, ½ to 1¼ in. long, narrowed at base into short petioles; cymules borne in all but the lower axils, 3 to 7-flowered, pedunculate, shorter than the leaves; calyx campanulate, the lanceolate lobes little longer than the tube; corolla 1 line long, little exceeding the calyx; stamens moderately exserted.—Montane, open flats or open pine forests, 5000 to 8200 ft.: San Jacinto Mts.; San Bernardino Mts. July-Aug.

2. **T. oblóngum** Benth. Stems erect, simple or branched, 6 to 13 in. high; herbage soft-villous or the leaves pubescent, the stems sometimes glandular; leaves oval or oblong (sometimes oblong-lanceolate), with narrowed base, costate-veined, membranous, ¾ to 1½ in. long, the petioles mostly short, ¼ to 1 (or 3) lines long; cymules glomerate, many-flowered, short-peduncule; calyx villous, its lobes narrow, longer than the tube, nearly equaling the corolla, this 3 lines long; filaments 4 to 5 lines long.—Montane, 2000 to 6000 ft.: San Jacinto and San Bernardino mountains; Sierra Nevada from Tulare Co. to Butte Co.; Humboldt Co.; n. to Wash. July-Aug.

3. **T. simulàtum** Jepson n. sp. Stem erect, branched, 7 to 11 in. high; the leaves large but rather remote; herbage glandular-villous; leaves ovate-lanceolate, 1 to 2 in. long, on petioles 2 to 6 lines long; cymules on peduncles 2 to 6 lines long; calyx-lobes broad, triangular-acute, about equaling the tube; corolla 2 lines long.—Plumas Co. to Siskiyou Co. (Klamathon, Copeland 3534, type). July.

4. **T. láxum** Gray. TURPENTINE WEED. Stem simple or branching, 8 to 12 in. high, sparsely leafy; herbage minutely pubescent; leaves lanceolate or oblong-lanceolate, acuminate, pinnately veined, 1 to 2 in. long, on slender petioles; cymes peduncled, rather loose; corolla purple or deep blue, thinly hirsute, its straight tube towards apex curved to one side and then a little below the horizontal, all the lobes equal.—Stream beds or low summer fields of the North Coast Ranges: Sonoma and Napa Cos. to Humboldt Co. and w. Glenn Co. July-Sept. Var. RUBRISÉPALUM Jepson n. comb. Leaves sessile or subsessile; pubescence long-pilose; calyx-lobes becoming red; corolla obscurely 2-lipped (ex char.).—San Benito Co. (T. rubrisepalum Elmer.)



809. Trichostema lanceolatum Benth.; *a*, fl. branchlet x ½; *b*, fl. x 1½; *c*, upper part of stamen x 2½; *d*, fr. x 2½.

5. **T. lánceolàtum** Benth. VINEGAR WEED. CAMPHOR WEED. Fig. 809. Stem simple or branching from near the base, very leafy, 6 to 16 in. high; herbage cinerous or villous-pubescent, minutely glandular; leaves lanceolate, acuminate, with 3 to 5 strong almost parallel nerves or ribs, ¾ to 1¼ in. long, sessile, or the lowest subsessile; cymes short-peduncled or nearly sessile; calyx villous; corolla light blue, almost filiform, somewhat pubescent, its straight tube towards apex abruptly and strongly

recurved like a hook; lobes of upper lip longer than those of the lower.—Dry plains and low hills, 100 to 2600 ft.: throughout cismontane Cal.; n. to Wash. A bee-plant of importance, abounding over extensive areas. Aug.-Sept.

6. **T. ovàtum** Curran. Stem stout, branched from base, rather crowded with leaves, 6 to 13 in. high; herbage densely villous; leaves ovate, apiculate with a callous cusp, 3 to 5-nervose, 6 to 11 lines long, subsessile; corolla 3½ lines long, the tube somewhat exserted; stamens long-exserted.—Bakersfield plain, Kern Co. May-June.

7. **T. lanàtum** Benth. Leafy shrub 2 to 4 ft. high, branched from the base; leaves linear-lanceolate, acute, glabrous above, more or less lanate below, revolute, 1-nerved, fascicled, 1 to 2 (or 2½) in. long, sessile; cymes subsessile or short-peduncled, dense, covered with a dense purple wool, borne in a virgate interrupted spike-like thyrse; corolla 9 lines long, blue-lanate outside, the tube little exserted from calyx; stamens exserted 5 to 11 lines beyond the calyx-tube.—Mountain slopes, 1000 to 4000 ft.: San Benito and Monterey Cos. to San Diego Co. May-June. It varies much in length and hue of the wool. Var. DENUDÀTUM Gray. Wool remarkably short; corolla-tube 1¼ to 1¾ times as long as calyx.—Ventura Co. to San Diego Co. (T. parishii Vasey.)

3. SCUTELLÀRIA L. Skull-cap

Ours perennial herbs, the flowers solitary in the opposite axils (axillary pairs) or, when the leaves are reduced, forming spikes or racemes. Calyx 2-lipped, both lips entire, the upper with a scale-like or crest-like projection on the back, in anthesis campanulate, after anthesis closed, and in fruit splitting to the base. Corolla with a long-exserted tube; upper lip galeate, entire or barely notched, the lateral lobes of the lower lip more or less attached to it so that it appears 3-lobed, the middle lobe seeming to constitute the whole lower lip. Stamens 4; anthers ciliate-pilose. Upper fork of style short or none. Nutlets rarely wing-margined. (Latin scutella, a dish, on account of the conspicuous protuberance on the fruiting calyx.)

Flowers 2 to 3 lines long, borne in racemes.....1. *S. lateriflora.*
Flowers 5 to 12 lines long, solitary in the axils of cauline leaves or some occasionally imperfectly racemose.
  Leaves all broad and somewhat cordate or truncate at base; tubers none or hardly any.
    Leaves acute, mostly serrate; corolla blue.....2. *S. epilobiifolia.*
    Leaves obtuse, mostly entire; corolla whitish or cream-color.....3. *S. bolanderi.*
  Leaves, at least the upper, obtuse or narrowed at base.
    Leaves oblong, or oblong-ovate to linear; stems erect; tubers none or hardly any.
      Corolla deep blue to purple, the lips commonly rather unequal.
        Leaves (at least above base) commonly linear or oblong, but varying to ovate, the petioles short (1 to 2 lines) or hardly any; corolla about 10 to 14 lines long, its tube narrow, curving, expanded only above.....4. *S. angustifolia.*
        Leaves commonly ovate to oblong-ovate, mostly with petioles 2 lines long; corolla about 5 to 7 lines long, its tube flaring immediately above calyx.....5. *S. antirrhinoides.*
      Corolla white, the lips subequal; leaves oval-ovate or oblong-lanceolate.....6. *S. californica.*
    Leaves broadly oval or ovate to spatulate-obovate; stems low or diffuse; rootstocks slender, terminated by tubers.
      Leaves ovate, toothed or rarely entire; corolla blue.....7. *S. tuberosa.*
      Leaves mostly spatulate-obovate; entire; corolla white.....8. *S. nana.*

1. **S. láteriflòra** L. Stem erect, freely branched, 1 to 2 ft. high; herbage puberulent or subglabrous; leaves ovate to ovate-lanceolate, acuminate, coarsely serrate, 1 to 2 in. long, on slender petioles 1 to 6 lines long; flowers in one-sided racemes, the racemes axillary and sometimes also terminal, 1 to 1¾ in. long; corolla 2 to 3 lines long, the lips short, equal.—Bouldin Isl., San Joaquin Co.; B. C. to e. U. S. and n. Mex.

2. **S. epilòbiifòlia** A. Ham. Stems slender, simple or branched, ¾ to 2 ft. high; herbage minutely puberulent; leaves ovate-lanceolate or oblong-lanceolate, serrate or the upper entire, subcordate at base, 1 to 1¾ in. long, subsessile or on petioles ½ line long, the uppermost much reduced; flowers axillary, 6 to 8 lines long, on pedicels shorter than the calyx; corolla blue, throat naked within, the lower lip nearly erect and slightly surpassing the

810. Scutellaria angustifolia Pursh; *a*, habit x ½; *b*, stamens and style x 1½; *c*, fr. calyx x 2.

upper. — Montane, 4000 to 6500 ft., Sierra Nevada from Eldorado Co. to Siskiyou and Modoc Cos.; also of the lower San Joaquin River islands; n. to B. C., e. to Nfd. and Ariz. July-Aug.

3. **S. bolánderi** Gray. Stems simple or branching chiefly from base, 6 to 17 in. high; herbage pubescent; leaves oblong-ovate or ovate-elliptic, obtuse, serrate, or the upper entire, closely sessile by an obscurely cordate base, ½ to 1¼ in. long; flowers 5 to 7 lines long, on short pedicels; corolla whitish, throat dilated, villous within, the lower lip rather larger than the upper. —Foothills and mesas, 1500 to 4000 ft.: Sierra Nevada from Plumas Co. to Tulare Co.; s. to the Cuyamaca Mts. May-July.

4. **S. angústifòlia** Pursh. Fig. 810. Stems erect, simple or somewhat branched, 7 to 13 (or 21) in. high; herbage glabrous or finely puberulent; leaves linear to oblong or ovate, entire or rather sparsely toothed, ¾ to 1½ (or 1¾) in. long, obscurely petioled or the lower distinctly petioled (the petioles 1 to 2 lines long); basal leaves orbicular to ovate or cordate, 5 to 7 lines long, the petioles usually longer; flowers 9 to 14 lines long, the pedicels equaling the calyx; corolla blue, the tube distinctly curving above calyx, the lips at maturity distinctly unequal, the lower one villous inside, its middle lobe with upturned edge. — Moist soil, or rocky ledges, montane, 1800 to 6000 ft.: San Jacinto, San Bernardino and San Gabriel mountains; Sierra Nevada; higher North Coast Ranges; n. to B. C. and Ida. Var. CANÉSCENS Gray. More branching, tomentulose-canescent; corolla-tube more upwardly curved at base of tube.—Sierra Nevada foothills.

5. **S. antirrhìnoìdes** Benth. Similar to no. 4; corolla-tube mostly straight, broadly clavate-dilated or abruptly inflated upward. —Meadows or lake margins, 500 to 4000 ft.: Mendocino Co. to Siskiyou Co., thence e. to Modoc Co., thence s. to Nevada Co.; n. to Ore. and Ida., e. to Utah.

6. **S. califórnica** Gray. CALIFORNIA SKULLCAP. Stems clustered, commonly simple, ½ to 1¼ ft. high, from horizontal branching rootstocks; herbage puberulent; leaves ovalovate or oblong-lanceolate, 8 to 14 lines long, the lower disposed to be crenate and purplish beneath, the upper narrower and entire, those subtending the flowers much reduced; petioles 1 to 3 lines long; corolla nearly white or slightly yellowish, 8 to 12 lines long, the throat ampliate-inflated and the lips equal or nearly so; lower lip villous-bearded within; nutlets rugulose. — Open

811. Scutellaria tuberosa Benth.; *a*, habit; *b*, tubers. x ⅔.

woods and borders of thickets, on hillsides and in ravines, 50 to 6000 ft.: Alameda Co. to Lake, Mendocino and Humboldt Cos.; Eldorado Co. to Tehama Co.

7. **S. tuberòsa** Benth. BLUE SKULL-CAP. Fig. 811. Stem 3 to 5 in. high, from tuberous rootstocks, the tubers oblong, 3 to 8 lines long; herbage pubescent; leaves thin, few-toothed; basal and lower leaves oval, purplish beneath (as also the lower cauline), on petioles as long as the blade; upper cauline ovate, the petioles commonly short; corolla violet-purple, 7 to 9 lines long; middle lobe of lower lip somewhat spreading, much larger than the galeate upper lip; nutlets muricate.—Loamy soil of shady woods or brush in the hills or in sandy valleys, 500 to 5000 ft.: coastal S. Cal.; Sierra Nevada; Coast Ranges, mostly toward the coast; n. to southern Ore. Mar.-May. Var. SÍMILIS Jepson. Calyx very densely villous.—Same range as the species. Apr.-June.

8. **S. nàna** Gray. Stems freely branched and somewhat tufted, densely leafy, 2 to 3 in. high; herbage densely grayish-puberulent; leaves obovate to spatulate-obovate, entire, thickish, 4 to 8 lines long, tapering into a short petiole; flowers long; corolla white, rather broad, with equal lips and dilated throat.—Interior plateau, ne. Cal.: Siskiyou Co.; ne. Shasta Co.; Lassen Co.; Modoc Co.; n. to Ore. and Ida., e. to Nev.

4 **SALAZÀRIA** Torr.

Divaricately branched shrub with spinescent branchlets. Flowers in loose spikes. Calyx oblong, with 2 very short truncate entire lips, in fruit thin, ovate-globose, conspicuously enlarged and resembling an inflated bladder. Corolla purplish, 2-lipped, the middle lobe of lower lip roundish with recurved sides, the small lateral lobes more connected with the erect galeate upper lip. Fertile stamens 4, the lower pair longer, the filaments slightly pubescent below. Upper fork of style very short or wanting. Nutlets depressed, roughened. (Don Jose Salazar, member of the U. S. and Mex. Boundary Survey Commission.)

1. **S. mexicàna** Torr. BLADDER SAGE. Fig. 812. Stems several in a cluster, simple below, intricately branched above, forming a clumpy bush 2 to 4 ft. high; leaves oblong or ovate, glabrous, 3 to 12 lines long, barely petioled; calyx 4 lines long; corolla 9 or 10 lines long, pubescent outside with short reflexed hairs; scarious fruiting calyx ½ in. in diameter; nutlets papillate-tessellate. — Dry washes and cañons, 500 to 4400 ft.: Mohave and Colorado deserts; e. to Utah, s. to Mex.

812. Salazaria mexicana Torr.; *a*, infl. x ¾; *b*, leaf of infl. x ½; *c*, leaf of sterile shoot x ½; *d*, fl. x 1¼; *e*, fr. calyx x ¾.

5. **MARRÙBIUM** L. HOREHOUND

Perennial tomentose herbs with much wrinkled leaves and rather small flowers in whorls. Calyx with cylindraceous tube, 10 ribs and as many equal subulate or spinulose teeth, which are recurved at tip. Corolla white, with short tube included in the calyx, the upper lip erect, 2-cleft, the lower spreading, 3-cleft. Stamens 4, included within the tube of the corolla, all the anthers 2-celled. Nutlets rounded at the top. (From the Hebrew, meaning bitter.)

1. **M. vulgàre** L. COMMON HOREHOUND. Stems tufted, erect, white-woolly, ¾ to 2¼ ft. high; leaves roundish, crenate, except at the cuneate or truncate base, petioled, white-woolly beneath and green above, or somewhat

tomentose on both faces; middle lobe of lower corolla-lip transversely oblong, much larger than the lateral lobes.—Common weed of old fields and waste places about farms and villages everywhere in the valleys and foothills; nat. from Eur. Evergreen with us. The tops are used medicinally as a remedy for colds. July-Sept.

6. **AGÁSTACHE** Clayt.

Tall perennial herbs. Leaves ovate, serrate, petioled. Flowers violet-purple or whitish, crowded in a terminal spike. Calyx tubular-campanulate, rather oblique, almost equally 5-toothed. Upper lip of corolla 2-lobed, nearly erect; lower lip spreading, its middle lobe crenate. Stamens 4, exserted, the anthers not approximate in pairs. (Greek agan, much, and stachus, a corn ear, in allusion to the numerous spikes.)

813. Agastache urticifolia Ktze.; *a*, fl. stem x ½; *b*, fl. x 2; *c*, nutlet, dorsal view x 10; *d*, nutlet, ventral view x 10.

1. **A. úrticifòlia** (Benth.) Ktze. Fig. 813. Stems erect, simple, 2½ to 5 ft. high; herbage glabrous or nearly so; calyx-lobes membranous, pinkish or whitish; corolla light violet-purple, its lobes slightly hairy but throat glabrous.—Dry flats or valleys, 2500 to 8000 ft.: San Bernardino Mts.; Sierra Nevada; North Coast Ranges; e. to Nev., n. to Wash. and Ida. (Lophanthus urticifolius Benth.)

7. **NÉPETA** L.

Perennial herbs. Calyx tubular, obliquely 5-toothed, the upper teeth longer than the lower. Corolla-tube enlarged above, distinctly 2-lipped; upper lip erect, lower spreading, the middle lobe larger than the lateral. Stamens 4, not exserted, ascending under the upper lip, the lower pair the shorter, all anther-bearing, with the anthers approximate in pairs. Nutlets ovoid, flattened, smooth. (Old Latin name used by Pliny, perhaps from the city Nepete in Tuscany.)

1. **N. catària** L. Catnip. Stems 2 to 3 ft. high; herbage canescent with fine hairs, except the green upper surface of the leaves; leaves triangular-ovate, truncate or cordate at base, coarsely crenate, 1 to 3 in. long or the upper reduced, greener above than below, petioled; spikes 1 to 3 in. long, dense or with 1 or 2 accessory whorls below; calyx-teeth lanceolate-subulate; corolla white, 4 or 5 lines long, dotted with purple.—Mountains and valleys, nat. from Eur.: San Antonio Mts.; Russian River Valley; Lake Co.; Modoc Co. July-Aug.

N. hederàcea (L.) Trev. Ground Ivy. Gill-over-the-Ground. Creeping and trailing; leaves reniform; corolla 3 times length of calyx, light blue.—Adv. from Eur.: Bouldin Isl., lower San Joaquin River.

8. **BRUNÉLLA** L. Self Heal

Low perennial herbs, the nearly simple stems terminated by a short-spicate or subcapitate inflorescence, each whorl composed of 6 subsessile flowers and subtended by broad floral bracts. Calyx reticulate-veiny, membranous or chartaceous, 2-lipped; upper lip truncate with 3 cusps; lower 2-cleft; lips closed in fruit. Corolla-throat inflated and tube more or less exserted; upper lip erect, galeate, entire; lower lip 3-lobed, the middle lobe hanging downward. Stamens 4, in pairs under the upper lip, each filament or those of the upper with a small tooth below the anther. Nutlets smooth and glabrous.

(Old German breune or braune, an affection of the throat, which Self Heal was used to cure.)

1. **B. vulgàris** L. Stem 4 to 10 in. high, green and nearly glabrous; leaves ovate or ovate-oblong, rounded at base, obscurely serrate, 1 to 3 in. long, petioled; corolla violet, pinkish or lavender, exceeding the purplish calyx; middle lobe of lower lip with setaceous-incised margin.—Gardens and lawns, nat. from Eur. Var. LANCEOLÀTA Fer. Leaves mainly lanceolate to oblong, gradually narrowed or cuneate at base; margins of bracts bristly-ciliate.—Meadows, 2500 to 6000 ft.: Sierra Nevada; San Bernardino Mts. Var. ÁTROPURPÙREA Fer. Margins of bracts glabrous or sparsely short-ciliate; corolla dark or blackish-purple.—Valleys, North Coast Ranges.

9. SÁLVIA L. Sage

Herbs or low shrubs with the flowers usually in whorls, the whorls forming terminal racemes or spikes, the floral leaves mostly reduced to bracts. Calyx 2-lipped, the upper lip entire or 3-toothed, the lower 2-cleft. Corolla with the upper lip erect, straight, concave or falcate, sometimes obsolete; lower lip spreading, 3-lobed, the middle lobe often emarginate, cleft or fringed. Stamens inserted in the throat of the corolla; lower pair fertile; upper pair obsolete or represented by sterile filaments or vestiges; anther-cells widely separated on a long filament-like connective longer than the filament itself and jointed to it by the middle or near one end; connective at its upper end (under the upper lip of the corolla) bearing a perfect anther-cell, at its lower end a reduced or deformed anther-cell or the anther-cell obsolete.—In some species the filament, while seemingly simple, is really jointed, thus indicating the presence of the connective, the lower end of which sometimes projects as a subulate point rarely but with a trace of an anther-cell. (Latin, salveo, to save, some of the species being officinal.)

A. Lower end of connective bearing a deformed anther-cell or a rudiment; flower-whorls few; nutlets commonly developing mucilage and long spiricles when wetted; annuals or perennials.

Herbage white-woolly; bracts much surpassing the flowers; leaves spine-tipped and -toothed.
- Annual; leaves 3 to 6 in. long, forming a basal rosette ..... 1. *S. carduacea.*
- Perennials; leaves not over 1½ in. long, cauline.
  - Herbage densely white-woolly; calyx resembling a woolly pellet, the teeth almost obscured by the woolly covering ..... 2. *S. funerea.*
  - Herbage white-tomentose; calyx finely and densely tomentulose but not concealing the spine-tipped teeth ..... 3. *S. greatai.*

Herbage green; bracts not exceeding the flowers; leaves not spine-tipped and -toothed; annuals ..... 4. *S. columbariae.*

B. Lower end of connective reduced to a subulate point or slender thread, or the filiform structure merely jointed and the filament thus apparently simple; flower-whorls several (except no. 7); nutlets unchanged when wetted; perennials.

Inflorescence densely whorled-glomerate and interrupted-spicate; corolla-tube longer than lower lip.
- Large-flowered; corolla 1¼ to 1½ in. long, crimson-purple; lower leaves cordate or hastate at base ..... 5. *S. spathacea.*
- Smaller-flowered; corolla 5 to 10 lines long, violet to white; leaves not cordate.
  - Bracts, upper floral leaves and 2-lipped calyx scarious-membranous, usually colored.
    - Leaves spatulate or obovate, obtuse or retuse, not rugose, entire (or sparsely crenulate); bracts purplish-tinged ..... 6. *S. carnosa.*
    - Leaves oblong, acutish, very rugose, crenulate.
      - Bracts apparently whitish; leaves of one kind, ovate ..... 7. *S. mohavensis.*
      - Bracts purplish or purplish-green; leaves of 2 kinds, oblong-lanceolate and linear-revolute ..... 8. *S. eremostachya.*
  - Bracts more or less herbaceous, at least not colored.
    - Corolla barely 6 lines long; bracts blunt or subulate or aristate-tipped.
      - Calyx-teeth and bracts subulate or aristate-tipped; plant not hoary white.
        - Herb-like, the stems 9 to 12 in. high, simple, almost leafless and scape-like; style and stamens long-exserted ..... 9. *S. sonomensis.*
        - Shrub 3 to 6 ft. high, branching and leafy; style and especially the stamens little exserted ..... 10. *S. mellifera.*
      - Calyx-teeth and bracts blunt; whole plant hoary white ..... 11. *S. leucophylla.*
    - Corolla 8 to 9 lines long; bracts more or less pointed.
      - Bracts and calyx-teeth long-aristate ..... 12. *S. vaseyi.*
      - Bracts and calyx-teeth merely acute or cuspidate.
        - Leaves acute, the longer 2 to 3 in. long; heads 4 to 8 ..... 13. *S. palmeri.*

Leaves obtuse, seldom over 1¼ in. long; heads solitary or few... 14. *S. clevelandii.*
Inflorescence thyrsoid-paniculate; floral leaves, bracts and bractlets small; corolla-tube shorter than lower lip.....15. *S. apiana.*

1. **S. carduàcea** Benth. THISTLE SAGE. Stems 1 to 6 from a basal leaf-rosette, naked and scape-like, bearing 1 to 4 whorls of flowers, 4 in. to 2 ft. high; herbage white-woolly, particularly in the flower-whorls, the wool more or less deciduous; leaves oblong in outline, pinnatifid, with spinulose-dentate margin, the basal 3 to 7 in. long; bracts ovate-lanceolate or lanceolate, pectinate-spinescent, surpassing the flowers; calyx long-woolly, its upper lip strongly 3-toothed, the middle tooth larger, the lateral distant, much surpassing the lower lip; corolla light blue, deeply 2-lipped, 1 in. long; upper lip 2-cleft, the segments laciniate or denticulate at the end; lower lip with small erose lateral lobes and an exceedingly large fan-shaped and laciniately fringed middle lobe; proper filament very short.—Valley plains, mesas and cañon flats, 50 to 2500 ft.: coastal S. Cal.; inner South Coast Ranges from Contra Costa Co. s.; San Joaquin Valley; Mohave and Colorado deserts. May-June.

2. **S. funèrea** Jones. Densely branched bush 2 to 2½ ft. high: herbage white-woolly; leaves ovate to ovate-lanceolate, often somewhat conduplicate or folded, leathery, coarsely nerved, acuminate and spine-tipped, entire or rarely with 1 or 2 pair of spiny teeth on the sides, ¾ to 1½ in. long, narrowed to a short broad petiole; bracts broadly lanceolate to broadly ovate, abruptly spinose; flowers in a spicate inflorescence, the spike rather dense or interrupted; calyx cylindric, inflated, very tomentose and resembling a pellet of wool, 3 lines long, the 5 equal teeth short, cuspidate, scarcely apparent; corolla purple; upper lip cleft, the sides turned backward; middle lobe of lower lip produced, rounded, erosulate, a little hairy on lower part, the lateral lobes small, much shorter; upper anther somewhat declined or pendulous, the lower one horizontal and larger.—Dry hills, 2000 to 2500 ft., Funeral Mts., Death Valley. April-May. Var. FORNÀCIS Jepson n. var. Bracts orbicular-ovate, abruptly acerose, 5 to 7 lines long, with prominent veins on the lower surface. —Furnace Creek, Death Valley (Parish 10,032 type).

814. Salvia columbariae Benth.; *a*, habit x ⅓; *b*, fl. x 1½; *c*, stamen x 5.

3. **S. grèatai** Bdg. Shrubby, 3 to 4 ft. high; herbage white-tomentose and a little resinous-glandular; bark whitish; leaves broadly ovate, 3 to 5-nerved, spine-tipped and bearing 1 to 3 pairs of remote or divergent spiny teeth on the sides, ½ to 1¼ in. long, sessile; inflorescence with 4 or 5 whorls, the whorls 6 to 10-flowered; outer bracts like the leaves, the inner becoming linear-lanceolate; calyx 4 lines long, the upper lip spine-tipped and with 2 smaller spine-like teeth near its base, the lower lip of 2 spine-tipped lobes; corolla about twice as long as calyx; upper lip 1½ lines long, 2-cleft, the lobes acute; lower lip slightly longer, 3-lobed, the middle lobe fimbriate; anther of lower fork of connective half as long as the upper and pollen-bearing.—N. side Colorado desert (Cañon Sprs.). Apr.

4. **S. columbàriae** Benth. CHIA. Fig. 814. Stems 1 or usually several from the base, commonly simple and bearing 1 or 2 pairs of leaves and 1 or 2 whorls of flowers, occasionally branching, 3 to 15 in. high; herbage finely pubescent, dark green; leaves mostly basal or sub-basal, bipinnatifid, very rugose, 1 to 2¼ in. long, petioled; bracts ovate or

more commonly orbicular and broader than long, abruptly acuminate and cuspidate-tipped, not exceeding the flowers, often purple; fruiting calyx 5 lines long, oblique at the throat; upper lip arched, crowned with a pair of needle-like prickles, the prickle representing the middle tooth wanting (or very minute); lower lip very much shorter, the teeth represented by 2 shorter prickles; corolla blue, little exceeding the calyx; upper lip emarginate; lower lip with small lateral lobes and a larger somewhat 2-lobed middle one. Hill slopes and mesas, 500 to 3500 ft., throughout cismontane Cal. Apr.-May. An infusion of the seeds was valued by the Mission fathers as a remedy for fevers; the seeds also furnished the "finest poultice for gunshot wounds." The Pomos roasted the seeds and ground them into a meal for food. Var. BERNARDÌNA Jepson n. comb. One to 2 ft. high; leaves pinnatifid, the divisions deeply lobed, not extending more than halfway to the midrib; bracts smaller; upper lip of calyx tipped with 3 aristiform teeth, these commonly united also to the end into 2 or 1.—Cañons about San Bernardino Valley, 1000 to 2500 ft. Mar.-May. (S. bernardina Parish.)

5. **S. spathàcea** Greene. CRIMSON SAGE. Fig. 815. Coarse herb with erect simple stems 1½ to 3 ft. high, very viscid and glandular-pubescent or -villous; leaves broadly oblong-ovate, with broadly triangular-cordate base, more or less doubly crenate or crenulate, upper surface dark green and rugulose, under surface whitened with a close short tufted tomentum, 4 to 8 in. long, on petioles 2 or 3 in. long or some of the cauline sessile; whorls of flowers 5 or 6 or more, subtended by broadly ovate or ovate-lanceolate membranous purplish bracts; calyx strongly veined, laterally compressed but somewhat inflated, 1 in. long or over, ½ in. wide at the broadest part, spathe-like, deeply slit in front between the two cuspidate-tipped teeth, the upper concave lip much larger, 3-dentate with the middle tooth largest; corolla crimson, 1¼ to 1½ in. long; upper lip short, nearly erect, emarginate; lower lip spreading, the lateral lobes short, triangular, acute, the middle lobe much developed, broadly obcordate, 4 lines broad; stamens much exserted; lower fork of the connective capillary, 1 line long; rudiments of sterile stamens obvious. — Coast Ranges from the Vaca Mts. and Mt. Diablo to coastal S. Cal. Apr.-May. Also called Humming-bird Sage. (Audibertia grandiflora Benth.)

815. Salvia spathacea Greene; *a*, leaf x ¼; *b*, fl. branchlet x ¼; *c*, fl. x 1; *d*, stamen x 2; *e*, sterile filament x 2.

6. **S. carnòsa** Dougl. Low broad shrub ¾ to 2½ ft. high, the branchlets canescent, leafy; leaves long, spatulate or obovate, obtuse or retuse, entire (or sparsely crenulate), finely tomentulose-canescent, glandular-dotted, not rugose, 3 to 6 lines long, all except the uppermost gradually tapering into a petiole, about as long; bracts and upper floral leaves obovate or oval, the innermost spatulate, pubescent, ciliate, tinged with rose or purple; calyx turbinate, upper lip broad, truncatish, with 3 short teeth; lobes of lower lip obtuse, mucronate, the cleft between its 2 lobes much deeper than between the lips; corolla deep blue, 4 to 5 lines long; upper lip cleft, its lobes erect, middle lobe of lower lip rather larger than the lateral, erosulate, notched at middle, the lateral lobes curving and approximate to it so as to

form a shallow bowl; stamens much exserted, the filaments with or without a tooth at the joint, the upper pair short, sterile.—Arid mountain slopes and plains, 2500 to 7500 ft.: San Bernardino Mts.; Mohave Desert; Inyo Co.; Siskiyou Co.; n. to Wash. May-June. Var. PILÒSA Jepson n. comb. Upper part of stem and entire inflorescence finely villous or hirsutulose-pubescent; upper calyx-lip short, rounded, emarginate, the 2 lower lobes lanceolate.—Mohave Desert; San Bernardino Mts. (Audibertia incana Benth. var. pilosa Gray. Ramona pilosa Abrams.) Var. COMPÁCTA Hall. Woody at the base only, 2 to 3 ft. high; leaves 1 to 2 in. long; inflorescence spike-like; bracts 6 to 7 lines long.—San Bernardino Mts.; San Jacinto Mts.; San Diego Co. (Audibertia incana Benth. var. pachystachya Gray. Audibertia pachystachya Parish.)

7. **S. mohavénsis** Greene. Shrub 1 to 2 ft. high; herbage puberulent; leaves oblong to ovate, acute or obtuse, rugose above, deeply reticulate-venulose below, crenulate, 6 to 8 lines long, the petioles ¼ to ½ as long and slender; flowers usually in a single terminal head; bracts ovate or elliptical, mucronate, glandular, apparently whitish, 6 lines long; corolla blue, its lips of about equal length; upper lip shortly cleft, the lower with its 3 lobes about equal, all entire or merely crosulate.—E. Mohave Desert. May-June. (Audibertia capitata Gray.)

8. **S. eremostàchya** Jepson n. sp. Shrub 2 to 2½ ft. high, the old stems with whitish bark; herbage hirsute or hirsutulose with spreading hairs; leaves almost dimorphic, those of the flowering branches oblong-lanceolate, plane or eventually somewhat revolute, 1 to 1⅜ in. long, obtuse, truncate at base, crenulate, the upper surface rugulose, the under surface markedly reticulate with hispidulose veins and sprinkled with resin globules; leaves of the short sterile lateral spurs fascicled, linear, strongly revolute, ½ to ¾ in. long; whorled heads 1 to 4; calyx 2-lipped, the upper lip bearing at apex 3 short spine-tipped teeth, the lower lip shorter, deeply cleft, the 2 teeth acuminate-spinose; corolla 8 to 9 lines long; upper lip short, rounded, cleft, the lower lip much longer, its middle lobe transversely elliptic, broadly notched, erosulate or sparingly incised, the lateral lobes small; stamens rising from the palate, 7 to 9 lines long, the filaments with a tooth at the joint.—Cañons on w. side Colorado Desert: Palm Cañon of San Jacinto to Mt. San Isidro (Indian Cañon, Collins Valley, Jepson 8847, type).

9. **S. sònoménsis** Greene. CREEPING SAGE. Flowering stems almost leafless and scape-like, 4 to 8 in. high, ascending from a leafy mat-like base; leaves oblong to obovate-spatulate, crenulate, green and rugulose above, whitish with a close dense tomentum beneath, 1 to 2¼ in. long, on petioles ⅓ to as long; calyx like that of S. mellifera but the prickly teeth of the larger upper lip short; corolla light violet; upper lip short, of two erect or somewhat retrocurved lanceolate lobes; lower lip large, much prolonged in the direction of tube, the lateral lobes acute, short, the middle lobe with its orbicular-dilated terminal portion turned abruptly downward, its margin denticulate or somewhat fringed; upper (sterile) stamens inserted at orifice of tube, bristle-like, divergent; two lower (fertile) stamens inserted on lower lip without the orifice, ascending, straight (nearly as long as the corolla); style long exserted.—Mountain slopes or cañons, 1000 to 4000 ft.: rare but widely distributed throughout cismontane Cal. May-June. (Audibertia humilis Benth.)

10. **S. mellífera** Greene. BLACK SAGE. Fig. 816. Shrub 3 to 6 ft. high, the herbaceous flowering branches very leafy at the base; leaves narrowly oblong, crenulate, green and rugulose above, cinereous-tomentulose beneath, 1½ to 3 in. long, petioled; spicate inflorescence with 4 to 6 rather small flower-whorls; leafy bracts oblong or ovate, those subtending the upper whorls much reduced; proper bracts ovate or oblong, cuspidate; lower lip of calyx very short, the 2 teeth prickly; upper lip arched, crowned by 3 short sharp teeth; corolla white or slightly lilac-tinged and rather small, its tube long, exserted; upper lip notched; lower lip widely and downwardly spreading, nearly twice as long as upper lip, its middle lobe transversely oblong or orbicular, emarginate and slightly denticulate, joined to the main part of the lip by a narrow constriction; stamens and style little exserted; lower

portion of connective in fertile stamens manifest at the joint as a subulate rudiment; upper pair of stamens represented by short sterile filaments, their tips approximate. — Mountain slopes, mesas and cañon walls, 50 to 4500 ft.: coastal S. Cal. and n. to Santa Cruz Mts. and Mt. Diablo. Apr.-May. (Audibertia stachyoides Benth.) An important bee-plant in S. Cal.; also called Ball Sage, Button Sage and Blue Sage.

816. Salvia mellifera Greene; *a*, fl. branchlet x ½; *b*, fl. x 2; *c*, long. sect. of corolla x 2; *d*, stamen x 4; *e*, nutlet x 3.

11. **S. leucophýlla** Greene. Purple Sage. Stems woody below, leafy, white-farinose above, 3 to 4 ft. high; leaves oblong-lanceolate or the lowest ovate, obtuse, the upper with truncate base, finely rugulose above, white-tomentulose beneath, 1 to 3 in. long, short-petioled; whorled heads 3 to 5, very dense; bracts oval or oblong, densely white-farinose; calyx splitting down in front, at length emarginate behind; corolla light purple, 5 to 7 lines long, the tube hardly exserted; stamens and style much exserted; connective almost continuous with the filament.—Mts. along the coast, 500 to 1500 ft., from San Luis Obispo Co. to the Santa Inez, Santa Monica and San Gabriel mountains. May-June. (Audibertia nivea Benth.)

12. **S. vâseyi** Parish. Shrub 3 to 5 ft. high, the flowering branches virgate; herbage whitish and only the lower leaves rugose-venulose; leaves round-ovate to quadratish-ovate, truncatish or very rounded at base, obtusish or subacute at apex, 1 to 1¾ in. long, the petioles ⅓ to ⅔ as long; upper leaves obtuse or subacute at base; bracts and calyx-teeth long-aristate; corolla white, 6 to 10 lines long; upper lip short, notched, its lobes rounded; lower lip longer than upper, spreading, its middle lobe developed into a transversely oblong structure which is notched and which nearly conceals the short lateral lobes.—Mountain slopes and cañons, n. and w. side Colorado Desert. (Audibertia vaseyi Porter. Ramona vaseyi Briq.)

13. **S. pàlmeri** Greene. Shrubby, 3 to 5 ft. high; leaves oblong to oblong-lanceolate, obtuse or acute, tomentulose-canescent, 1 to 2 (or 3) in. long; spike virgate, naked, its whorled heads 4 to 8, remote; bracts oblong or lanceolate, slender-cuspidate or acuminate, puberulent, 3 to 6 lines long; calyx-throat very oblique, the upper lip acute, 1 to 3-mucronate, the very short lower teeth cuspidate; corolla white, 5 to 7 lines long.—Washes and cañon flats, San Diego Co. April-June.

14. **S. clevelándii** Greene. Shrub 1 to 2 ft. high; herbage canescent, or the leaves white-tomentulose beneath; leaves oblong or the upper oblanceolate-oblong, obtuse, ¾ to 1¼ in. long, short-petioled; heads solitary, or few and rather distant; bracts ovate or oblong, mucronate or abruptly short-pointed, viscid-pubescent; calyx viscid-pubescent, the lower teeth short and subulate, the upper lip entire and cuspidate-tipped; corolla white, 7 to 9 lines long.—Chaparral slopes, 1000 to 3300 ft., San Diego Co. May-Aug.

817. Salvia apiana Jepson; *a*, lower leaves x ⅓; *b*, panicle x ⅓; *c*, fl. x 1½; *d*, stamen x 2½.

15. **S. apiàna** Jepson. WHITE SAGE. Fig. 817. Shrubby, 3 to 5 (or 10) ft. high, branches virgate; leaves oblong to elliptic, 1 to 4 in. long, serrulate or subentire, mostly very white above and below, short-petioled; panicle virgate, 1 to 4 ft. long; corolla white, 6 to 9 lines long, the tube short (2 to 3 lines long); upper lip very short or almost obsolete, the lower lip much developed, the conspicuous palate curved upward so as to close the throat; middle lobe fringed, the lateral lobes small; style and stamens long-exserted.—Mesas and cañons, 1000 to 2500 ft.: coastal S. Cal., e. to west side Colorado Desert. (Audibertia polystachya Benth.)

10. MELÍSSA L.

Lemon-scented branching perennial herb, with broad dentate petioled leaves and white flowers in loose axillary clusters. Calyx narrowly campanulate, 13-nerved, deflexed in fruit; upper lip 3-toothed, the lower 2-parted. Corolla exserted, nearly twice as long as the calyx, 2-lipped, the upper lip erect, notched; lower lip spreading, 3-cleft. Stamens 4, converging under the upper lip. (Greek melissa, a bee, these insects visiting the flowers for honey.)

1. **M. officinàlis** L. GARDEN BALM. Stems somewhat decumbent at base, ¼ to 2 ft. high; stems and petioles short-villous; leaves hispidulous above, truncate at base, 2½ in. long or less, the petiole ⅓ to ½ as long; calyx-teeth unequal; corolla 5 lines long.—Sparingly nat. from Eur., where it is cultivated as a culinary potherb; Marin Co.; Santa Rosa; Guerneville.

11. ACÁNTHOMÍNTHA Gray

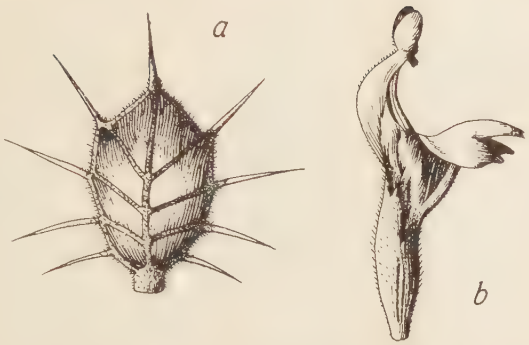
Annuals with dentate leaves and flowers in distinct or at length remote whorls, each whorl subtended by a pair of leaves and a circle of broad callous-margined bracts armed with needle-like spines. Calyx 2-lipped; upper lip 3-toothed, the teeth aristate; lower lip short, 2-cleft into oblong acute lobes. Corolla 2-lipped, its tube exceeding the calyx, naked within; upper lip entire, oblong; lower lip 3-lobed. Stamens 4, inserted high in the ample throat; lower pair fertile; upper pair smaller or with imperfect anthers. Nutlets smooth. (Greek acantha, thorn, and mentha, mint.)

Bracts orbicular, with about 10 spines on the margin; anthers glabrous; style glabrous; herbage subglabrous.....1. *A. ilicifolia.*
Bracts elliptic-ovate, with about 7 spines on the margin.
Anthers glabrous; style hairy; herbage puberulent.....2. *A. lanceolata.*
Anthers woolly; style glabrous; herbage subglabrous.....3. *A. obovata.*

1. **A. ilicifòlia** Gray. Stem widely branching from near the base, 4 to 13 in. high; herbage minutely puberulent or subglabrous; leaves roundish-ovate, crenate, obtuse, broadly cuneate at base, 5 to 7 lines long, on petioles about ½ as long; bracts orbicular, with strong callous nerves and margins, about 10-spinose, 4 to 5 lines long; corolla white and rose-color, 6 lines long.—Mesas and mountain valleys, 1000 to 5000 ft.: Mt. Pinos; w. San Diego Co.

2. **A. lanceolàta** Curran. Fig. 818. Stem stoutish, branching from the base, 7 to 12 in. high; herbage soft-pubescent, oily and ill-scented; leaves ovate to oblanceolate, sparingly dentate, tapering to a slender petiole; body of bracts

elliptic-ovate, 5 to 6 lines long, the aristate prickles 3 to 4 lines long; corolla rather deeply 2-lipped, its tube rather broad, bearing within at base a zone of deflexed hairs; upper lip keeled and somewhat falcate-incurved, cleft at apex; lower lip shallowly saccate, 3-lobed, the lobes entire, the middle lobe oblong, the lateral ovate-acute. —Mt. Hamilton Range and Santa Cruz Mts.



818. Acanthomintha lanceolata Curran; *a*, bract; *b*, fl. x 2.

3. **A. obovàta** Jepson n. sp. Fig. 819. Stems branching from the base, minutely canescent, 4 to 9 in. high; leaves obovate, denticulate, puberulent or subglabrous above, 6 to 9 lines long, on petioles 3 to 6 lines long; bracts as in A. lanceolata; corolla 6 lines long, its tube slender, its limb shallowly 2-lipped as compared with A. lanceolata; upper lip entire, a little hooded; lower lip with a curved band of hairs on the palate; corolla-tube glabrous within or with a zone of scattered hairs at the middle; stamen pairs nearly equal; anthers woolly; style glabrous. — San Carlos Range (s. San Benito Co., Julia A. Bettys, type).

819. A. obovata Jepson; fl. x 2.

12. **POGÒGYNE** Benth.

Low sweet-aromatic annuals with obovate or oblanceolate leaves narrowed into a petiole. Whorls crowded into dense spikes or the lower whorls distinct. Bracts and calyx hirsute. Calyx unequally and deeply 5-cleft, the two lower teeth longer; tube mostly 15-nerved; throat naked. Corolla straight, tubular-funnelform, blue or purplish; upper lip erect, entire; lower spreading, with 3 similar oval lobes. Stamens 4, with anthers, or the upper shorter pair sterile. Style somewhat exserted, in some (perhaps all) species flattened above and always bearded. (Greek pogon, beard, and gune, female, on account of the hairy style.)

Stamens all four with perfect anthers; style conspicuously bearded above, its lobes almost equal; corolla 6 to 9 lines long.
Inflorescence oblong- or cylindrical-spicate, nearly continuous; bracts and calyx conspicuously white-hirsute or hispid with long rigid marginal hairs.
Stout, about 1 ft. high; bracts acute; lower calyx-lobes twice as long as the tube. 1. *P. douglasii.*
More slender, lower; bracts mostly obtuse; lower calyx-lobes hardly longer than the tube ..... 2. *P. parviflora.*
Whorled clusters more or less distant; bracts and calyx inconspicuously hirsute-ciliate. 3. *P. nudiuscula.*
Upper stamens sterile; style sparingly hairy, its lobes very unequal; corolla smaller (1½ to 2 lines long).
Stems stoutish, erect; leaves ovate or oval; inflorescence capitate or short-spicate.... 4. *P. ziziphoroides.*
Stems slender, diffuse; leaves obovate-oval or spatulate; inflorescence an oblong or longer and much interrupted spike..... 5. *P. serpylloides.*

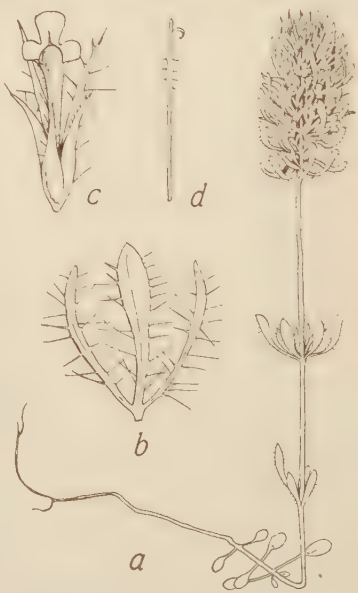
1. **P. douglàsii** Benth. Fig. 820. Stem freely branched from the base or sometimes simple, 4 to 6 in. high, rarely 2 ft. high; leaves oblanceolate or obovate, ¾ to 1¼ in. long, narrowed to a petiole; whorls forming a dense terminal spike, often with a single accessory whorl in the adjacent axil below, or sometimes several of the lower axils with flowers; bracts cuspidate, the margin ciliate with white hairs; lower divisions of calyx twice longer than tube; corolla blue, the palate white, dotted with purple, bristly, 7 to 9 lines long; stigmas subequal; nutlets smooth, often mottled, minutely hispid at the apex.—Low summer-dry fields that have been overflowed in the winter season: Coast Range valleys; Great Valley; Sierra Nevada foothills. It often colors large areas in May and June.

820. Pogogyne douglasii Benth.; *a*, habit x ½; *b*, fl. x 1½; *c*, corolla spread out x 1½; *d*, calyx spread out x 2.

2. **P. parviflòra** Benth. More slender than no. 1; bracts mostly obtuse; calyx-teeth rather broad, the lower barely longer than the tube; corolla 5 lines long.—Sonoma Co.; e. to San Joaquin Co.

3. **P. nudiúscula** Gray. Stems 6 to 12 in. high, the branches slender, puberulent; leaves 4 to 12 lines long, spatulate, obtuse, glabrous; whorls of flower-clusters distant; bracts linear-subulate, cuspidate, these and the calyx inconspicuously hirsute-ciliate; calyx-lobes lanceolate- or linear-subulate, cuspidate; corolla ½ in. long, about twice as long as the calyx; anthers of the upper stamens smaller than the others but polleniferous. — San Diego. Apr.-June.

4. **P. ziziphoroìdes** Benth. Fig. 821. Stems short, commonly several from the base, 3 to 7 in. high; leaves obovate; bracts ciliate with white bristly hairs; whorls below distinct, with long internodes, above forming a short spike or sometimes capitate; corolla 3 to 4 lines long (the calyx-teeth distinctly shorter), light purple, the center of lower lip with white and dark purple markings; 2 lower stamens with large anthers, the 2 upper with very small anthers or none and with shorter filaments or wholly obsolete.—Low places in fields: Sacramento Valley and e. to Sierra Nevada foothills, thence s. to Mariposa Co. Apr.-May.



821. Pogogyne ziziphoroides Benth.; *a*, habit x ¾; *b*, bract x 7½; *c*, fl. x 3; *d*, pistil x 5.

5. **P. serpýlloides** Gray. Stems many from the base, very slender, diffuse, 3 to 6 in. long; leaves obovate-oval or spatulate, petioled, 2 to 4 lines long; whorls except the terminal ones distinct, the lower with few or even solitary flowers; bracts sparsely hairy; calyx-lobes all longer than the tube, equaling or exceeding the violet or bluish corolla; corolla 1½ to 2 lines long, short-pubescent outside; sterile stamens small, with rudiments of anthers or with none; style a little bearded above. — Foothills, 500 to 2200 ft.: San Luis Obispo Co. to Humboldt Co., common; San Benito Co. to Mt. Diablo; Sierra Nevada foothills from Tuolumne Co. to Amador Co. May.

13. CLINOPÒDIUM L.

Ours a perennial herb. Flowers scattered or loosely clustered. Calyx tubular, about 13-nerved, the 3 upper teeth broader (and united slightly higher) than the 2 lower; tube in ours with a band of erect hairs inside at the summit. Corolla

strongly 2-lipped, with a straight tube much exceeding the calyx. Stamens 4, all anther-bearing, ascending under the upper lip, the upper pair shorter; anthers conniving in pairs. (Greek kline, a bed, and podos, foot, the flower of one species likened to a bed-castor.)

1. **C. mímuloides** (Benth.) Ktze. Slender, 2 to 5 ft. high; herbage pilose and hirsutulose; leaves ovate, serrate, 1½ to 3 in. long, the petioles about ⅓ as long; calyx 6 to 7 lines long; axillary clusters 1 to 5-flowered, the pedicels ½ to 1¼ in. long; corolla orange-red or pale crimson, 1⅜ to 1⅝ in. long, very Mimulus-like; upper lip erect, cleft; lower lip spreading, its middle lobe much longer than the lateral; tube within at base very nectariferous.—Shady stream beds or moist places in thickets, 1000 to 4000 ft., near the coast from Monterey Co. to Santa Barbara Co. and s. to the San Gabriel Mts. July-Oct. (Calamintha mimuloides Benth.)

14. **SATURÈIA** L.

Ours a suffrutescent plant. Flowers commonly in clusters of 2 to 4 in the axils. Calyx 10 to 15-nerved, 2-lipped, the 3 teeth of the upper lip equal and a little shorter than the 2 ovate-acute teeth of lower lip. Corolla white, 2-lipped. Stamens 4, scarcely exserted, the lower a little longer. Style hairy on one side. (The Latin name.)

1. **S. chándleri** (Bdg.) Druce. Stems 3 ft. high, branching, "forming clumps"; herbage hirsutulose; leaves thick, round-ovate, obtuse, truncatish at base, weakly crenulate, 5 to 7 lines long, the petioles 1 to 4 lines long; calyx tubular-turbinate, 15-nerved, 3½ to 4 lines long, hairy without, glabrous within except on the teeth; upper lip of corolla cleft, lower lip 3-cleft, with 2 lines of hairs, all the lobes obtuse.—W. San Diego Co. (San Miguel Mt.). (Calamintha chandleri Bdg.)

15. **MICROMÈRIA** Benth.

Trailing evergreen perennial with very slender stems. Flowers small, white, solitary and pediceled in the axils. Calyx tubular, about equally 5-toothed and striately 12 to 15-nerved. Corolla 2-lipped, the tube straight, shorter than or exceeding the calyx. Stamens 4, all anther-bearing, shorter than the corolla. Style glabrous. (Greek mikros, small, and meros, part, on account of the small size of the flowers.)

1. **M. chamissònis** (Benth.) Greene. YERBA BUENA. Fig. 822. Stems slender, ½ to 2 ft. long; herbage slightly pubescent; leaves round-ovate, crenate, glandular-punctate, especially on the under surface, ½ to 1 in. long; petioles 1 to 3 lines long; flowers 3½ to 4 lines long; calyx and corolla exteriorly short-hairy; lower pair of stamens longer.—Common in woods near the coast: Humboldt Co.; Marin Co.; Berkeley; Santa Cruz Mts.; Monterey and s. to Santa Monica Mts. June. The trailing stems root at the tips in winter and thus multiply the plant vegetatively. (M. douglasii Benth.)

822. Micromeria chamissonis Greene; *a*, sect. of fl. stem x ½; *b*, fl. x 3; *c*, corolla spread open x 3; *d* pistil x 3.

16. **SPHÁCELE** Benth.

Low shrub or merely suffrutescent. Flowers solitary in the axils of the reduced upper leaves, thus forming a leafy raceme. Calyx campanulate, deeply and nearly equally 5-toothed, naked within, about 10 to 15-nerved, reticulate-veiny, conspicuously inflated and membranous after flowering. Corolla large and rather showy, with 4 short spreading lobes, the fifth and lowest lobe much longer

823. Sphacele calycina Benth.; *a*, fl. branchlet x ⅔; *b*, nutlet x 4.

and erect; tube broad, a hairy ring at base within. Stamens 4, somewhat ascending; filaments naked; anthers somewhat approximate, the cells diverging. (Sphakos, the name of the Greeks for sage, the plants of this genus having similar foliage.)

1. **S. calýcina** Benth. PITCHER SAGE. Fig. 823. Erect, 3 to 5 ft. high; herbage pubescent or even somewhat woolly; leaves very veiny or scarcely reticulated, broadly ovate to oblong-ovate, obtuse, dentate or serrate, the base entire and varying from cordate to acute, 2 to 4 in. long, the lower on petioles ½ in. long, the uppermost sessile; calyx in anthesis rather broad at base, its lobes triangular-lanceolate; corolla white or pink-tinted, ⅞ to 1⅛ in. long; calyx in fruit ovoid-inflated, ¾ to 1⅛ in. long; nutlets black, finely pubescent but smooth, elliptical in outline, nearly 2 lines long.—Hillsides and cañons of the Coast Ranges: Vaca Mts.; Marin Co.; Santa Cruz Mts.; Monterey. May-June. On the higher ridges the leaves are small and very rugose. Passes into: Var. GRÁCILIS Jepson n. comb. Leaves often subentire, very obtuse; calyx in anthesis rather narrow at base.—Dry interior cañons from Monterey Co. to Mt. Diablo. (S. gracilis Eastw.) Var. WALLÀCEI Gray. Lower cauline leaves truncate at base; calyx in anthesis narrow-based, villous, its lobes linear- or narrow-lanceolate.—San Gabriel Mts.; Catalina Isl.; Santa Cruz Isl. (S. fragrans Greene.) Var. GLABÉLLA Gray. Herbage and calyces subglabrate; leaves broadly cuneate at base.—Santa Barbara Co.; Ventura Co.

17. STÀCHYS L. HEDGE NETTLE

Ours hispid or soft-pubescent herbs with the flowers few in the axils of the floral leaves, usually forming an interrupted spicate inflorescence. Calyx tubular-campanulate or turbinate, 5 to 10-nerved or -ribbed, with 5 nearly erect or spreading pointed equal teeth, sometimes the upper larger and more or less united. Corolla with cylindrical tube, not dilated at the throat; upper lip erect or slightly turned backward, over-arched or concave, entire or notched; lower lip longer, spreading, 3-lobed, the middle lobe larger, the lateral lobes often deflexed. Stamens 4, in pairs, ascending under the upper lip of the corolla, or one or both pairs sometimes deflexed to the sides of the throat and contorted after anthesis. Nutlets obtuse at the apex. (Greek stachus, an ear of corn, hence a spike; given to these plants on account of their spicate inflorescence.)

Flowers large; corolla-tube nearly twice as long as calyx; floral whorls distant; stems retrorsely hispid or hirsute, especially on the angles.
  Corolla red, the tube 7 to 9 lines long ..... 1. *S. chamissonis.*
  Corolla purplish, the tube 4½ to 6 lines long ..... 2. *S. californica.*
Flowers smaller; corolla-tube little or not at all longer than the calyx (except in no. 7).
  Herbage white-woolly; floral whorls distinct or indistinct, the inflorescence 3 to 9 in. long; flowers whitish ..... 3. *S. albens.*
  Herbage not white-woolly.
    Floral whorls forming a dense spike; herbage very hirsute; flowers whitish .... 4. *S. pycnantha.*
    Floral whorls distinct and rather remote.
      Herbage silky-villous or -hirsute; flowers whitish; corolla-tube with a hairy ring below its middle ..... 5. *S. ajugoides.*
      Herbage hispid; flowers purplish
        Corolla-tube with an oblique ring of hairs at its middle; petioles of lower leaves 1 to 2 in. long ..... 6. *S. bullata.*
        Corolla-tube with an oblique ring of hairs below its middle; petioles of lower leaves very short ..... 7. *S. veronicaefolia.*

1. **S. chamissònis** Benth. Fig. 824. Stem erect, simple, ending above in 1 to 3 racemes, 3 to 8 ft. high, the angles of the stems retrorsely scabrous, the hairs pustulate, often viscid; leaves soft-pubescent, ovate, 3 to 6 in. long; calyx clavate-tubular, 5 to 7 lines long; corolla red, its tube 8 to 15 lines long, much exserted, with a hairy ring near base.—Swamps or wet places near the coast: San Luis Obispo Co.; Santa Lucia Mts.; Pilarcitos, San Mateo Co.; San Francisco; Pt. Reyes; Mendocino Co.; Elk River Valley, Humboldt Co.; n. to Ore. The herbage has a clinging disagreeable odor.

824. Stachys chamissonis Benth.; *a*, fl. stem x ½; *b*, leaf x ½; *c*, fl. x 1; *d*, sect. corolla-tube spread out, showing hairy ring inside x 1½.

2. **S. californica** Benth. Stems slender, 1½ to 4 ft. high, hispid, especially in the angles, with pustulate hairs; leaves oblong-ovate to ovate, or ovate-lanceolate, ample, cordate or subcordate at base, sparsely villous-hispid, 2 to 4 in. long, petioled, flower-whorls rather remote; corolla-tube 4½ to 6 lines long, nearly twice as long as the calyx, the hairy ring at base horizontal.—Shady woods near the coast: Santa Cruz Mts.; Monterey Co.; s. to San Gabriel Mts. June.

3. **S. álbens** Gray. Stem erect, strict, 2 to 5 (or 10) ft. high; herbage white-tomentose; leaves ovate to lanceolate, obtuse or cordate at base, 1½ to 4 in. long, sessile or subsessile, mostly the very lowest short-petioled; whorls many-flowered, the inflorescence dense and spike-like, 3 to 9 in. long, sometimes the whorls remote; calyces often somewhat yellow-green, the teeth a little over half as long as the tube, awn-pointed.—Along rivulets or near springs in the dry inner Coast Ranges: Lake Co. to Pacheco Pass and s. to cismontane S. Cal.; also in the delta lowlands of the lower Sacramento and San Joaquin rivers. May-Aug. Var. JULIÉNSIS Jepson n. var. Flower-whorls mostly remote; calyx-teeth as long as tube.—Springy spots in the mts., 2000 to 7000 ft., Sierra Nevada from Mariposa Co. to Fresno Co. (McKinley Grove, A. L. Grant 1198, type). July.

4. **S. pycnántha** Benth. Stem erect, ¾ to 1¼ ft. high; herbage mostly green but hirsute, the surface of the leaves somewhat granulate-glandular; leaves ovate to oblong-ovate, 1 to 4 in. long, obtuse or subcordate at base, mostly petioled; flowers in a dense cylindraceous bractless or nearly bractless spike 1 to 2 in. long; lowest whorls rarely separate; calyx-teeth deltoid, mucronate, commonly equaling the tube.—Near the coast, rather uncommon: Marin Co. to San Luis Obispo Co. July-Sept.

5. **S. ajùgoides** Benth. Stem simple, mostly erect, 1 to 2 ft. high; herbage densely soft-pubescent but usually green, sometimes glabrate; leaves oblong or ovate, obtuse or subcordate at base, 1 to 2½ (or 4) in. long, petioled, the upper sessile; flower-whorls mostly distinct but not remote, or with 1 or 2 whorls below in the axils of the upper foliage leaves; calyx short-campanulate or turbinate, very silky-villous, often concealing the teeth; hairy ring below middle of corolla-tube very oblique, the tube slightly constricted below.—Everywhere common in low lands, wet valleys or springy cañons, 5 to 5000 ft., throughout cismontane Cal. May-Aug. Var. STRÍCTA Jepson. Small resin-glands abundant beneath the short pubescence on the leaves; leaves thinnish, ovate-lanceolate or oblong, 3 to 3½ in. long, only the uppermost sessile;

825. Stachys bullata Benth.; fl. branchlet x 1.

calyx-teeth erect or somewhat connivent around the tube of the corolla; upper lip of corolla very short; corolla-tube without evident constriction, the ring of hairs horizontal, not oblique.—Knights Valley, Sonoma Co. Var. VELÙTINA Jepson. Pubescence short and close; leaves cordate-ovate; spike elongated, interrupted.—Suisun Marshes. Oct. This variety forms a transition to the preceding species.

6. **S. bullàta** Benth. Fig. 825. Stem simple, or sometimes branched above, erect or ascending, 10 to 22 in. long; foliage densely or sparsely hispid, the stems retrorsely hispid, especially on the angles; leaves oblong-ovate, sometimes varying to elliptic, coarsely crenate, truncate or subcordate at base, 1 to 2 (or 3½) in. long, the lower on petioles 1 to 2 in. long; flowers about 6 in a whorl, the whorls rather remote (mostly 6 to 12 lines apart); calyx turbinate or campanulate-turbinate, the teeth triangular, cuspidate, in age spreading, somewhat indurated; corolla-tube 4 lines long, exserted about 1 line, bearing within at its middle an oblique ring of hairs interrupted on the upper side opposite the style and indicated exteriorly by a distinct although only partial constriction; filaments densely pubescent at the middle.—Low hills, 20 to 2500 ft.: Coast Ranges; coastal S. Cal. Mar.-Apr. When the flowers first open and the stamens stand erect, the lower pair of stamens are at that time distinctly although but slightly longer than the upper.

7. **S. verónicaefòlia** Davy. Stem simple or branched from base, 1¼ to 2 ft. high; herbage somewhat hispid; leaves elliptic or ovate-oblong, 1 to 2 in. long, the upper sessile, the lower on very short petioles; floral whorls remote; corolla-tube 4 lines long, usually exserted for nearly half its length, with an oblique hairy ring within below its middle.—Placer Co. to Shasta and Modoc Cos. May-Aug.

18. PYCNÁNTHEMUM Michx. MOUNTAIN MINT

Glabrous or canescent perennial herbs with white flowers in densely crowded whorls, the whorls remote and leafy-bracted or the uppermost subtended by a pair of somewhat reduced leaves. Calyx oblong or tubular, its teeth equal. Corolla-tube little exceeding the calyx; upper lip almost entire, lower 3-cleft. Stamens 4, nearly equal. (Greek pychnos, dense, and anthemon, flower, the inflorescence glomerate.)

1. **P. califórnicum** Torr. Stem simple, erect, 2 to 3½ ft. high; leaves ovate to ovate-lanceolate, serrulate along the sides, the acuminate apex and rounded or cordate base entire, 1½ to 3½ in. long; calyx pubescent, the tips of the teeth very woolly exteriorly; corolla white, sprinkled with resin dots, its throat hairy.—Chaparral slopes or mountain meadows, 2500 to 5300 ft.: San Jacinto and San Bernardino mountains; Sierra Nevada; e. to Nev. July-Aug. (Koellia californica Ktze.)

19. LÀMIUM L. HENBIT

Hairy herbs. Flowers in 1, 2 or 3 compact whorls. Calyx with 5 nearly equal awn-pointed teeth, much surpassed by the elongated corolla tube. Corolla-tube much enlarged at the throat; upper lip erect or arched, entire or slightly notched; lower lip spreading, the middle lobe broad, the lateral lobes small and acute or tooth-like. Anthers hairy in ours. (Greek laimos, throat, the corolla gaping.)

1. **L. amplexicáule** L. GIRAFFE HEAD. Low annual, decumbent at base; internodes below the inflorescence very long; leaves rounded, toothed or lobed, the lowest petioled and cordate, the floral sessile; corolla purplish-red, the upper lip bearded, the lower spotted.—Introduced from Eur., occasional: Ft. Bragg; Sonoma Co.; St. Helena; Mt. Eden; Little Arthur Creek, Gilroy; Columbia, Tuolumne Co.

MOLUCCÉLLIA LAÈVIS L. Shell-flower. Molucca Balm. Annual; leaves roundish, crenate; whorls 6-flowered; bracts spinose; calyx-base campanulate, nerved, expanded above into a very broad wing; corolla white, 2-lipped, shorter than the calyx.—Foothills, w. Colusa Co.; adv. from Eur.

20. **HÝPTIS** Jacq.

Herbs or shrubs. Calyx with 5 subequal teeth. Corolla short, the lobes of upper lip and lateral lobes of lower lip similar, flat, equal; middle lobe of lower lip with a transverse ridge or narrow fold at the contracted base and produced beyond into a bowl-shaped sac. Stamens 4, the upper pair shorter, all fertile, declined, included in the sac of the lower lobe. (Greek, uptios, turned back, referring to the lower lip.)

1. **H. émoryi** Torr. BEE-SAGE. Shrub, the numerous straight erect slender stems forming a compact clump 4 to 8 or 12 ft. high; herbage fragrant, white scurfy-tomentose; leaves ovate, truncate at base, crenulate, ½ to 1 in. long, on petioles half as long; flowers in short-peduncled axillary clusters at the ends of the branchlets; pedicels nearly as long as calyx; calyx narrowly turbinate, white-scurfy or white-woolly with pinnately branched hairs; corolla violet, 2 lines long, the upper lip with its lobes turned back to back; upper pair of stamens with densely hairy filaments, lower pair glabrous or nearly so.—Desert valleys and cañon flats: e. Mohave Desert; Colorado Desert; e. to Ariz., s. to Mex.

21. **MONARDÉLLA** Benth.

Low herbs, for the most part pleasantly fragrant. Flowers in heads; heads terminal on the stems or branches, subtended by broad involucral bracts, which are often more or less colored. Calyx tubular, narrow, 15-nerved, the 5 teeth equal or nearly so. Corolla purple, lavender or dull white; upper lip erect, 2-cleft, the lower 3-parted, all the lobes linear or narrowly oblong. Stamens 4, all fertile, strongly or moderately unequal, exserted. (Diminutive of Monarda, on account of its resemblance to that genus.)

A. FLOWERS LARGE AND RATHER LOOSE IN THE HEAD; COROLLA-TUBE MUCH LONGER THAN LIMB; PERENNIALS.

Corolla scarlet or yellowish, 1½ in. long, the tube greatly exceeding the calyx..... 1. *M. macrantha.*

Corolla white, yellowish or tinged with rose, ¾ to 1¼ in. long, the tube little exceeding the calyx.....2. *M. nana.*

B. FLOWERS SMALLER, MORE DENSELY CAPITATE; COROLLA-TUBE BUT LITTLE LONGER THAN LIMB.

1. Perennials, often slightly woody at base.

Bracts foliaceous; leaves toothed.
Leaves round-ovate to lanceolate, more or less toothed.
Leaves cinereous, not venulose; rare.....3. *M. cinerea.*
Leaves greenish and pubescent above, markedly venulose; common..4. *M. villosa.*
Leaves rhomboidal to oblong or oblanceolate, entire.
Leaves densely lanate below, moderately so above, strongly revolute..5. *M. lanata.*
Leaves lanate below, bright green above, not strongly revolute.....6. *M. viridis.*
Bracts membranous, usually purplish or pinkish-tinged; leaves mostly entire.
Leaves strongly revolute, tomentose below with a close white felt....7. *M. hypoleuca.*
Leaves not strongly revolute; tomentose or white-puberulent covering, if present, not confined to the lower surface of the leaves.
Herbage more or less white-puberulent or uniformly covered with a fine silvery pubescence; leaves narrow, elongate.
Leaves 1 to 2 in. long, linear-lanceolate, distant, those subtending the head conspicuously longer than the floral bracts and flowers; bracts acute to somewhat acuminate.....8. *M. viminea.*
Leaves ⅓ to 1 in. long, linear to oblong or lanceolate, at least the lower close together, those subtending the head not longer than the floral bracts and flowers; bracts acute or obtuse.....9. *M. linoides.*
Herbage glabrous, pubescent or tomentose, not white-puberulent or silvery-pubescent; leaves broader.
Leaves plane.
Stems 6 to 18 in. high; leaves ½ to 1½ in. long; bracts broadly ovate, acute.....10. *M. odoratissima.*
Stems 2 to 5 in. high; leaves smaller (3 to 7 lines long); bracts lanceolate-ovate, the upper acute, the lower acuminate..... 11. *M. australis.*
Leaves strongly undulate-margined.....12. *M. crispa.*

2. Annuals.

Leaves strongly undulate-margined.....13. *M. undulata.*
Leaves plane.
Bracts greenish or purplish, membranous or somewhat foliaceous, not white or thin-transparent.
Leaves subtending the head longer than the acute bracts and the calyx.....
14. *M. lanceolata.*
Leaves subtending the head, if present, not longer than the abruptly acuminate bracts and the calyx.....15. *M. pringlei.*
Bracts partly white or transparent-scarious.
Calyx-teeth white-tipped.
Bracts with white tips and margins; calyx-teeth acute.....16. *M. candicans.*
Bracts thin, transparent-scarious; calyx-teeth subulate, recurved.....
17. *M. leucocephala.*
Calyx-teeth not white-tipped.
Bracts strongly fenestrate, the veins broad; calyx-teeth subulate-lanceolate..
18. *M. douglasii.*
Bracts not strongly fenestrate, the veins narrow; calyx-teeth acute.....
19. *M. breweri.*

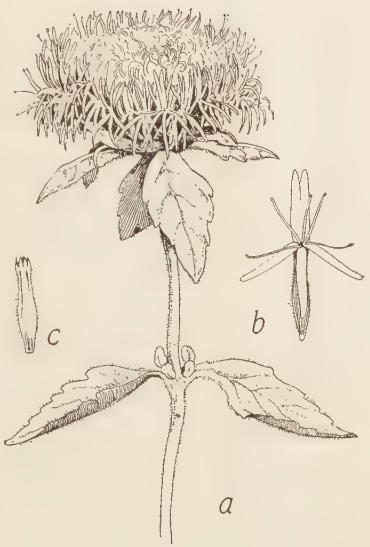
1. **M. macrántha** Gray. Fig. 826. Stems simple or branched, 2 to 12 in. high, from creeping woody rootstocks; herbage more or less puberulent or villous, often purplish; leaves ovate, obtuse, revolute, entire or sometimes slightly toothed, more or less hispid-pubescent, ciliate, lower surface punctate with dark dots, ¼ to 1 in. long, petiolate; heads terminal, 2 to 18-flowered, the bracts leafy, narrowly ovate, acute or obtusish, 4 to 11 lines long, villous-ciliate; calyx 10 to 12 lines long, pubescent and somewhat glandular, sparsely villous within at the upper end, the 5 teeth nearly equal, subulate, the sinuses thickened; corolla scarlet, pubescent without, 1 to 1¼ in. long, the tube narrowly funnelform, the lips 2½ lines long, the lobes of the lower linear, obtusish; stamens much exserted, the lower pair the longer, filaments sometimes sparsely pubescent. —Montane, 1000 to 4500 ft.: Monterey Co. to San Diego Co.; s. to L. Cal. May-Aug. Var. LONGÍLOBA Abrams. Corolla yellowish, the tube more slender, the lips 3½ or 4 lines long.—San Jacinto River and Mountains. Var. PINETÒRUM Hall. Stems 2 to 4 in. long; herbage ashy pubescent; leaves 2 to 4 lines long, tending to be crowded; corolla pale yellow to almost white, conspicuously pubescent; stamens not exserted beyond the corolla-lobes.—Mt. San Jacinto, 6000 to 8000 ft.

826. Monardella macrantha Gray; *a*, habit x ½; *b*, calyx x 1.

2. **M. nàna** Gray. Stems from creeping rootstocks, woody at base, simple or somewhat branched, 4 to 10 in. high; corolla rose-tinged, white or yellowish, slender, ¾ to 1¼ in. long, the lobes 3 lines long, the tube little exceeding the calyx; stamens little exserted. —Mts. of San Diego Co., 4000 to 8000 ft. June-Aug. Var. TÉNUIFLÒRA Abrams. About 3 in. high; leaves oblong or rotund, 2 to 4 lines long; flowers white or yellowish.—San Jacinto Mts. Var. ÁRIDA Abrams. Two to 3 in. high, densely branching from a woody base; leaves 2 to 4 lines long, much curled; bracts white, sometimes purplish-tinged. —Santa Rosa Mts.

3. **M. cinèrea** Abrams. Dwarfish plant, the stems from a branching root-crown, 1 to 4 in. long, very leafy; leaves ovate, sparingly or obscurely serrate, 2 to 4 lines long, subsessile; heads 6 to 7 lines broad; corolla-tube not exserted.—San Antonio Mts., 7000 to 9000 ft.

4. **M. villòsa** Benth. COYOTE MINT. Fig. 827. Stems several from the base, mostly simple, tough or somewhat suffrutescent at base, ¾ to 1½ ft. high; herbage pubescent or tomentose; resin dots more or less conspicuous on lower surfaces of leaves and bracts, or none; leaves round-ovate to lanceolate-ovate, commonly more or less serrate, glabrate or pubescent, veins conspicuous, ½ to 1 in. long; petioles 2 to 3 lines long; bracts ovate to lanceolate, foliaceous, pinnately veined; calyx 4 lines long, pubescent or hirsute-pubescent, the teeth and upper end of tube hairy within; corolla pubescent within and without, the tube exceeding the calyx, the limb more than half as long; stamens exserted, or about equaling the linear lobes of the corolla; filaments glabrous or sparsely hairy; flowers purple to pink or dull white. — Dry rocky hills, 300 to 2000 ft.: Coast Ranges from San Luis Obispo Co. to Siskiyou Co., thence se. in the Sierra Nevada to Amador Co. In typical form near the sea, Monterey Co. to San Francisco, but varying greatly in pubescence, foliage and general aspect. Var. INTÈRIOR Jepson. Leaves coarsely few-toothed, the teeth sometimes salient; heads large.—Vaca Mts. Var. LEPTOSÌPHON Torr. Large-flowered, cinereous, with a finer pubescence; leaves nearly entire, ovate to ovate-oblong.—Mt. Tamalpais. Var. TOMENTÒSA Jepson n. comb. Stems and lower surface of leaves (especially the upper) and bracts, also the calyx, covered with gray tomentum; bracts foliaceous; heads terminal or sometimes smaller ones in the upper axils.—Dry flats or hill slopes: Mt. Hamilton; Mt. Tamalpais; Napa Range; Mendocino Co. (M. tomentosa Eastw.) Var. FRANCISCÀNA Epling. Stems reclining or diffuse, more or less woolly-pubescent; leaves broadly ovate, serrate to entire, pubescent above, especially the upper ones, woolly-pubescent below, ½ to 1¾ in. long; heads densely flowered.—Coast from Pt. Reyes to San Luis Obispo. June-July. (M. franciscana Elmer.) Var. SHELTÒNII Jepson n. comb. Leaves oblong or ovate to lanceolate; bracts mostly foliaceous; corolla nearly glabrous within, the lobes of the lower lip much more than ½ the length of the tube, the upper lip cleft for more than ½ its length.—Montane, 3000 to 5000 ft.: Sierra Nevada from Mariposa Co. to Shasta Co., thence s. to Humboldt and Lake Cos. (M. sheltonii Torr.)



827. Monardella villosa Benth.; *a*, fl. stem x 1; *b*, fl. x 1½; *c*, calyx x 1½.

5. **M. lanàta** Abrams. Stems branched, about 1 ft. high; herbage lanate below the inflorescence; leaves oblong to oblanceolate, obtuse, entire, revolute, ½ to 1 in. long, petioled, the veins inconspicuous; bracts 4 lines long, densely pubescent, villous-ciliate; calyx 3½ lines long, slightly villous above within; corolla pubescent, the tube equaling the calyx, the limb more than ½ as long; stamens exserted, the filaments pubescent.—Mts. of s. San Diego Co.

6. **M. víridis** Jepson. Stems diffuse, 1 to 3 ft. long, woody at base; leaves rhomboidal to oblong-obtusish, somewhat revolute, narrowed at base to a slender petiole, the whole ½ to 1¼ in. long, bright green on the upper face, white-lanate on the lower, both faces conspicuously punctate with large dots; heads subglobose, 1 to 1⅛ in. broad, on long and almost naked peduncles; bracts thick, little differentiated from the leaves, deflexed; calyx glandular-dotted, the teeth somewhat hirsute; flowers lavender.—Dry foothills: Napa Range and n. to Lake Co. (M. ledifolia Greene.)

7. **M. hypoleùca** Gray. Stems simple or somewhat branched, reddish-brown, pubescent, 1 to 2 ft. high; leaves ovate-lanceolate, revolute, entire, obtuse, ½ to 1½ in. long, petioled, the lower surface densely white-tomentose, the upper green and glabrous, veins prominent; inflorescence a dense rounded head; bracts ovate, obtuse, pubescent, villous-ciliate, purplish, punctate below with resin dots, ½ in. long, longer than the calyx; heads 1 in. broad; calyx 3 lines long, villous without, glabrous within; corolla pubescent without, the tube equaling the calyx-tube, the limb more than ½ as long; filaments exserted, very sparsely hairy.—Mts. along the coast from Santa Barbara Co. to San Diego Co. Var. SAXÍCOLA Jepson n. comb. Stems ½ to 1 ft. high, stiffly branching from near the base, covered with a retrorse pubescence; leaves smaller, less strongly revolute, the lower surface densely puberulent; heads smaller, the bracts mostly shorter than the calyx.—San Antonio Mts. (M. saxicola Jtn.)

8. **M. vimínea** Greene. Tall, at least 2 ft. high, the lower part of the stems woody; herbage puberulent; leaves linear-lanceolate, obtuse, distant, 1 to 2 in. long, the uppermost subtending the head and much longer than the bracts; bracts 7 lines long, ovate, acute to somewhat acuminate, pubescent, resinous-dotted, rather sparingly ciliate; calyx pubescent, resinous-dotted.—Mts. of San Diego Co.

9. **M. linoìdes** Gray. Stems in rather dense clusters, 8 to 12 in. high, from a woody base; herbage pale gray-green, evenly clothed with a very fine pubescence; leaves linear to narrowly oblong, obtuse, entire, 6 to 10 lines long, the upper sessile, the lower petioled; bracts varying greatly in size in a single head, broadly ovate to oblong-ovate, acute or obtuse, membranous, pale or pinkish-tinged, pinnately veined, ciliate, glandular; calyx 3½ lines long, pubescent, with few resinous dots, the teeth short, subulate, pubescent or somewhat villous without and within; corolla-tube pubescent within and without, the upper lip cleft nearly to base.—Montane, 5000 to 7000 ft., San Jacinto Mts. s. to San Diego Co. June-July. Var. STRÍCTA Parish. Branching from base with many short leafy sterile branchlets; herbage pale green, pubescent; leaves entire or remotely denticulate, linear-lanceolate, those on the main branches 6 to 10 lines long, those on the sterile branchlets much shorter; heads solitary, terminal or sometimes racemose; bracts ovate to lanceolate, acute or acuminate, often purplish-tinged; calyx pubescent, often somewhat hispid; corolla-tube strongly exserted, more or less hairy within; filaments more or less hairy toward base.—San Gabriel Mts.; San Bernardino Mts.; Providence Mts. Var. ANÉMONOÌDES Jepson n. comb. Stems thickly leafy below, above almost scape-like, the long-peduncled heads with somewhat enveloping petaloid bracts, thus giving the aspect of some 1-flowered species of Anemone.—Argus Mts.; Greenhorn Mts.; Mt. Pinos. (M. anemonoides Greene.) Var. PÁLMERI Jepson n. comb. Bracts obtuse; calyx-teeth linear-lanceolate.—Santa Lucia Mts. (M. palmeri Gray.)

10. **M. odòratíssima** Benth. Stems several from the base, commonly simple, 6 to 12 in. high; herbage often pale, glabrous or finely pubescent; leaves narrowly ovate to lanceolate, entire, punctate with dark dots, the veins often obscure, ½ to 1½ in. long, petiolate; bracts ovate to lanceolate or often attenuate above, membranous, pinkish or purplish-tinged, pubescent, resinous-dotted, 3 to 6 lines long, the lower often somewhat foliaceous, ciliate towards base, the upper membranous; calyx 3½ to 4½ lines long, more or less pubescent, the acute teeth white-hirsute without and within; corolla more or less pubescent below limb without and within, the expanded upper end of tube exserted from calyx, the lower lip 2 lines long, slightly exceeding the upper, about ½ the length of the tube, upper lip cleft for about ½ its length; stamens commonly slightly hairy at base, the longer pair exceeding the corolla-lobes.—Montane, 2300 to 9000 ft., from Tulare Co. to Siskiyou Co., thence s. to Humboldt Co.; n. to Wash., e. to Utah. June-Aug. Var. OVÀTA Jepson n. comb. Bracts thin and somewhat fenestrate, the subscarious portion purplish.—Siskiyou Co. (M. ovata Greene.) Var. NEGLÉCTA Jepson n. comb. Stem 2 to 8 in. high, glabrous or puberulent; leaves ovate, somewhat serrate, purplish, glabrous, 3 to 10 lines long; bracts and calyx purplish, nearly glabrous, the former ciliate, the latter with teeth hispidulous; corolla purple.—Tiburon hills, Marin Co. (M. neglecta Greene.)

11. **M. austrālis** Abrams. Stems decumbent, from a woody base, 2 to 5 in. high; herbage pubescent to hirsute, glandular; leaves 3 to 7 lines long, oblong to ovate, obtuse, entire or sparingly toothed; bracts 3 to 6 lines long, ovate, acute to broadly acuminate, glandular, ciliate, the lower somewhat foliaceous, the upper petaloid, greenish or purplish; calyx pubescent or hispid with spreading hairs, glandular, often purplish; corolla-tube exserted, the upper lip cleft about half way to base.—San Jacinto Mts., 9200 ft. July.

12. **M. crīspa** Elmer. Stems about 1 ft. high, much branched from a woody base, tomentulose or the young parts white-tomentulose; leaves oblanceolate, obtuse, undulate, pubescent, punctate below, ½ to 1 in. long, petiolate; heads mostly solitary, compact, subglobose; bracts ovate, acute or obtuse, membranous; calyx villous-pubescent; corolla purple, the tube but little exserted.—Coast of Santa Barbara Co. at Surf. May.

13. **M. undulāta** Benth. Stems erect, simple or loosely branched, 5 to 15 in. high, reddish-brown; herbage puberulent or often somewhat hispid; leaves thickish, oblong-oblanceolate or linear, obtuse, narrowed at base, undulate-margined, ¾ to 1¼ in. long; heads 1½ to 2 in. broad; bracts broadly ovate or almost round, thin and somewhat scarious, whitish or pinkish, obtuse or acute, without cross veinlets between the conspicuous parallel nerves; calyx-teeth triangular, or somewhat oblong, not cuspidate; corolla rose-purple.—Hills near the sea: Pt. Reyes; San Francisco; s. to S. Cal. June.

828. Monardella lanceolata Gray; *a*, habit x ⅓; *b*, bract of involucre x 1½; *c*, fl. x 1½.

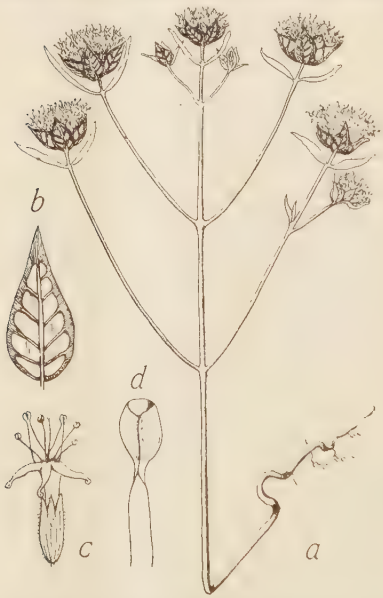
14. **M. lánceolāta** Gray. MUSTANG MINT. Fig. 828. Stem ¼ to 2½ ft. high, simple or branched, glabrous below, puberulent above; leaves oblong-lanceolate to lanceolate, obtuse, entire, ½ to 2 in. long; bracts ovate to ovate-lanceolate, acute, glandular, minutely ciliate, the lower foliaceous, the upper often purplish; calyx pubescent, the acute teeth ciliate; corolla rose-purple, its lobes long and narrow.—Hill slopes or valleys, 1500 to 4000 (or to 6000) ft.: Sierra Nevada foothills from Shasta Co. to Mariposa Co.; Monterey Co. to the San Bernardino and San Jacinto mountains and San Diego Co. Var. MICROCÉPHALA Gray. Much branched; heads much smaller; bracts not over ¼ in. long.—San Diego Co. Var. SANGUÍNEA Jepson n. comb. More freely and divaricately branching; leaves more often elliptic-lanceolate; corolla well exserted, dark red-purple.—Montane, 5000 to 6000 ft.: Cuyamaca Mts.; San Jacinto Mts.; s. Sierra Nevada in Tulare Co. (Madronella sanguinea Greene.) Var. GLANDULÍFERA Jtn. Upper parts of the stems, also the leaves and bracts, covered with stalked glands; corolla dark red-purple, the tube and throat glandular.—Browns Flats, San Antonio Mts.

15. **M. prínglei** Gray. Stem simple or branched from the base, 10 to 12 in. high; herbage finely pubescent, sometimes glandular above; leaves oblong to broadly lanceolate, entire or remotely toothed, ½ to 1 in. long, tapering to a petiole; heads small, very compact, terminating the main stem and branches; bracts broadly ovate, abruptly acuminate, purple-tipped, strongly veined, without cross-veinlets, pubescent, ciliate, 4½ lines long; calyx pubescent, the teeth strongly hairy within; corolla-tube exserted.—Sandy soil, San Bernardino Valley.

M. ÉLMERI Abrams. Puberulent; leaves lanceolate to narrowly ovate; calyx-teeth narrowly triangular-subulate, herbaceous or tinged with rose-purple (ex char.).—Acton, Los Angeles Co.

16. **M. cándicans** Benth. Stem simple below, somewhat branched above, 5 to 13 in. high; herbage puberulent; leaves lanceolate to oblong, obtuse, puberulent, ½ to 1½ in. long, tapering to a slender petiole; bracts ovate, acute or obtuse, pubescent, greenish with white tips and margins, the parallel nerves with cross veinlets between; calyx-teeth more or less villous, the tips white.—Foothills, 500 to 2500 ft.: Sierra Nevada from Kern Co. to Eldorado Co. May-June. Var. EXILIS Gray. Bracts often purplish, the apex acuminate, this and the margins white.—Sandy flats, deserts or arid mts., 2500 to 4000 ft.: Mohave Desert and bordering mountain slopes; s. Sierra Nevada in Kern Co.

17. **M. leùcocéphala** Gray. Stems branching, 6 to 7 in. high; herbage pubescent; leaves oblong- to ovate-lanceolate, 6 to 8 lines long, petiolate; heads many, small, terminal or axillary; bracts ovate to orbicular, acuminate, thin, white-scarious, the nerves pubescent; tips of calyx-teeth white, subulate, recurved, hispid.—Sandy soil, Merced plains. June.



829. Monardella douglasii Benth.; *a*, habit x ⅓; *b*, bract of involucre x 1½; *c*, fl. x 1½; *d*, gland x 12.

18. **M. douglásii** Benth. Fig. 829. Stems loosely branched, 4 to 12 in. high; herbage below bracts pubescent, often hispidulous; leaves narrowly oblong or lanceolate, short-petioled, ¾ to 1½ in. long, the upper somewhat resinous-dotted; heads on terminal or axillary peduncles; bracts ovate and ovate-lanceolate, cuspidate, resinous-dotted, with strong pinnate ribs confluent along the margin, the spaces between them silvery-scarious; calyx sparingly hirsute-pubescent, the teeth hirsute within; corolla deep purple, the tube little exserted beyond the cuspidate triangular-lanceolate calyx-teeth; lobes of upper lip ending in a cup-like gland.—Hill slopes, 1500 to 2500 ft.: Mt. Diablo, Mt. Hamilton and Pacheco Peak ranges from Contra Costa Co. to San Benito Co.; e. slope Santa Cruz Mts. It is remarkable for its fenestrate bracts. Var. PÁRRYI Jepson n. var. Stouter, about 6 in. high; bracts purplish, strongly hirsute-ciliate, broader, with larger fenestrae.—Chico, Butte Co. (C. C. Parry, type).

19. **M. brèweri** Gray. Stem 6 in. high; herbage finely scabrous-pubescent; leaves oblong or narrowly ovate, short-petioled, the lower over 1 in. long; bracts broadly ovate, abruptly acuminate-cuspidate, whitish-scarious, the outer pinnately 7 to 9-ribbed, the inner with the ribs parallel and converging to the point; calyx-teeth triangular-lanceolate, not cuspidate; corolla rose-color or rose-violet, the tube much surpassing the calyx.—Corral Hollow (inner South Coast Range).

22. LŸCOPUS L. WATER HOREHOUND

Perennial herbs similar to Mentha, but bitter and much less aromatic. Flowers small, white or whitish, in sessile capitate glomerules, apparently whorled, the upper axils flowerless. Calyx campanulate, 4 or 5-toothed (naked in the throat). Upper lobe of corolla entire. Fertile stamens 2, the upper pair without anthers, the tips of the filaments in ours thickened. Nut-

lets with thickened margins. (Greek lukos, wolf, and pous, foot, perhaps on account of the shape of the leaves in the original species.)

Stems from creeping rootstocks, not bearing stolons; leaves petioled, irregularly and incisely toothed ..... 1. *L. americanus.*
Stems from a root-crown, perennial by stolons; leaves sessile, regularly serrate ..... 2. *L. lucidus.*

1. **L. americànus** Muhl. Fig. 830. Stem erect, branching above, 2 to 3 ft. high, very acutely 4-angled, from creeping rootstocks, not bearing stolons; herbage nearly glabrous; leaves broadly or narrowly lanceolate, incisely toothed or laciniate-pinnatifid, 1 to 2 in. long, narrowed at base into a slender petiole; calyx-teeth acute; corolla-tube filled with horizontally spreading hairs which close the tube as with a fine mesh; rudiments of sterile stamens conspicuous; inner angle of nutlet granulose at apex.—San Bernardino Valley; lower Sacramento River; San Francisco; n. to B. C., e. to the Atlantic. Sept.-Oct. (L. lacerus Greene.)

2. **L. lùcidus** Turcz. Stems stoutish, not so sharply angled as in no. 1, at base producing stolons; leaves broadly or narrowly oblong, coarsely and incisely toothed, sessile, the lower 3 in. long and ¾ in. wide, the upper reduced; calyx-teeth attenuate-subulate.—Salt marshes and river bottoms: San Bernardino Valley; Los Angeles; San Francisco; Benicia; Suisun; n. to Wash.; ne. Asia. Aug.

830. Lycopus americanus Muhl.; *a*, fl. stem x ½; *b*, fl. x 2½; *c*, fruit and calyx x 10; *d*, nutlet, dorsal view x 14; *e*, nutlet, ventral view x 14.

23. MÉNTHA L. Mint

Very odorous perennial herbs, mostly with slender creeping rootstocks, usually tomentose or hairy and with rather small flowers in whorls, which are either remote or spicate or capitate. Calyx campanulate or short-tubular, commonly 5-toothed, nearly regular, or 2-lipped. Corolla with a short tube; upper lip emarginate or entire, scarcely or not at all larger than the lobes of the lower lip. Stamens 4, erect and nearly equal. Nutlets smooth. (Ancient Greek name.)

Flower-whorls in the leaf axils, distinct.
Herbage commonly light green; branches leafy to the ends; calyx-teeth similar and equal or nearly so ..... 1. *M. arvensis.*
Herbage somewhat grayish; leaves toward the end of the branches reduced and inconspicuous; calyx-teeth dissimilar, the 2 lower lanceolate-subulate ..... 2. *M. pulegium.*

Flower-whorls in terminal spikes or some in the upper leaf axils.
Leaves petioled; spikes thick, dense or little interrupted ..... 3. *M. piperita.*
Leaves sessile or nearly so; spikes slim, mostly interrupted ..... 4. *M. spicata.*

1. **M. arvénsis** L. Tule-Mint. Fig. 831. Stems simple or much branched, 1½ to 4 ft. long, developing suckers at base; herbage tomentose-pubescent or hoary to greenish and almost glabrous; leaves ovate to oblong-lanceolate, sharply serrate, 1 to 2¾ in. long, tapering at base into a short petiole; whorls of flowers often shorter than the petioles; calyx pubescent, its teeth ¼ to ⅓ as long as the tube; stamens well exserted.—Common in marshes and meadows of valleys and mts.: e. to the Atlantic. Aug.-Sept. Cymes sometimes raised out of the axils on peduncles. (M. canadensis Fl. W. Mid. Cal.)

2. **M. pulègium** L. Pennyroyal. Stems 1 to 2 ft. long, erect or prostrate and rooting at the joints; herbage pubescent with short white hairs; leaves elliptic- to oblong-ovate, serrate or entire, ½ to 1 in. long, petioled; whorls

831. Mentha arvensis L.; *a*, fl. branchlet x ½; *b*, fl. x 2½; *c*, nutlets x 7½.

dense, the leaves smaller or inconspicuous towards the ends of the branches; 3 upper calyx-teeth triangular, acute, the 2 lower lanceolate-subulate, ciliate-bristly. — Nat. from Eur.: Sonoma Co.; Marin Co.; islands of the lower San Joaquin.

3. **M. piperita** L. PEPPERMINT. Stem erect, commonly strict and unbranched below the terminal inflorescence; herbage glabrous; leaves ovate-oblong to oblong-lanceolate, acute, sparsely and sharply serrate, distinctly petioled; spikes dense, scarcely interrupted; calyx resinous-glandular, the lower teeth subulate, the upper ones triangular-acute; corolla white with a pink tinge or purple; lobes of lower lip spreading, similar to the upper lip.— Nat. from Eur., along streamlets in low fields: Berkeley; Haywards; Alvarado. Sept.

M. CITRÀTA Ehrh. Bergamot Mint. Stems producing leafy stolons at base; herbage glabrous; lower leaves broadly ovate, truncatish at base; calyx and corolla glabrous; corolla purple.—Adv. from Eur.: Mecca; San Bernardino; Fresno.

4. **M. spicàta** L. SPEARMINT. Similar to no. 3; leaves sessile or subsessile; flower-whorls crowded; spikes very narrow, leafless, commonly interrupted; calyx campanulate, its teeth subulate, nearly as long as tube.—Nat. from Eur., rather common in wet places: Berkeley; Napa Valley; Lake Co.

M. ROTÚNDIFÒLIA Huds. Apple Mint. Stems producing leafy stolons; herbage woolly-pubescent, the leaves often white beneath; leaves broadly ovate or orbicular, serrate, subcordate at base, channeled on the upper side opposite the veins; calyx and corolla puberulent; corolla white.—Adv. from Eur.: San Bernardino Valley; Los Angeles River.

SOLANÀCEAE. NIGHTSHADE FAMILY

Herbs or shrubs with alternate leaves. Flowers complete and regular. Peduncles terminal or axillary, bearing an umbel, cyme or panicle, or a solitary flower. Calyx 5-cleft or toothed, usually persistent. Corolla 5-lobed, the lobes valvate or imbricate and mostly plicate in the bud. Stamens 5, inserted on the corolla and alternate with its divisions. Ovary superior, 2-celled; style 1; stigma entire or sometimes 2-lobed. Fruit a berry or capsule.— Datura has a falsely 4-celled capsule. Petunia has the upper leaves opposite. (A family distinguished on the whole by its poisonous or acrid properties; includes such cultivated plants as Chilies, Cayenne Pepper, Tomato, Potato, Ground Cherry, Bitter-sweet, Belladonna, and Petunia.)

Fruit a capsule; corolla tubular or funnelform.
- Flowers solitary in the axils; herbs.
  - Corolla very large; capsule spiny, falsely 4-celled ..... 1. DATURA.
  - Corolla very small; capsule smooth, 2-celled ..... 2. PETUNIA.
- Flowers in a terminal panicle; capsule 2-celled, smooth ..... 3. NICOTIANA.

Fruit a berry.
- Corolla funnelform; spiny shrubs ..... 4. LYCIUM.
- Corolla rotate; herbs, or some species woody at base.
  - Anthers connivent, longer than the filaments; calyx remaining small. 5. SOLANUM.
  - Anthers not connivent, mostly shorter than the filaments.
    - Calyx herbaceous, not inflated, closely investing the berry ..... 6. CHAMAESARACHA.
    - Calyx in fruit becoming large and bladdery, and loosely enclosing the berry .. 7. PHYSALIS.

1. DATÙRA L. Thorn-Apple

Coarse rank-smelling herbs. Leaves large, ovate, mostly sinuate-dentate, petioled. Flowers large, solitary on short peduncles in the forks of the branching stem. Calyx tubular, 5-toothed, in our species at length cutting through near the base, the lower part persisting as a collar or rim beneath the capsule. Corolla funnelform with ample limb, convolute-plicate in the bud. Stamens included; filaments long. Stigma bilamellate. Capsule prickly or spiny, 4-valved from the top or the valves indefinite. The placentae project from the axis into the middle of the cells and connect with the walls by a partition imperfect at the top and thus form a falsely 4-celled ovary and capsule. (The Hindoo name, dhatura.)

Calyx not prismatic; corolla large (6 to 8 in. long), its limb 3 to 6 in. wide; capsule nodding on the short recurved pedicel, bursting irregularly, the calyx-rim rotate; seeds light-colored, flat, smoothish, with a cord-like margin; perennial..... 1. *D. meteloides.*

Calyx prismatic; corolla small (2 to 4 in. long), its limb 2 in. wide or less; capsule definitely 4-valved, the calyx-rim reflexed; seeds dark-colored, finely rugose and roughly pitted; annual.

Capsule nodding, globose, pubescent as also the stout prickles.....2. *D. discolor.*

Capsule erect, glabrous.

Corolla purplish or bluish; prickles subequal.....3. *D. tatula.*

Corolla white; prickles very unequal.....4. *D. stramonium.*

1. **D. meteloides** DC. Tolguacha. Fig. 832. Erect branching plant 2 to 3 ft. high; herbage grayish; calyx with 5 lanceolate teeth; corolla white, tinged with violet, its limb 3 to 6 in. wide, provided with 5 slender teeth ½ to ¾ in. long; anthers white, 6 lines long; capsule globose, 1 in. long, densely prickly, indefinitely valved or bursting irregularly; prickles short, 1½ to 2½ lines long, dilated and pubescent at base. — Sandy valley lands, 20 to 4000 ft.: Sacramento and San Joaquin valleys to coastal S. Cal.; Inyo Co. to Colorado Desert; e. to Tex., s. to Mex. July-Sept.

832. Datura meteloides DC.; *a*, fl. branchlet; *b*, fr. x ¼.

2. **D. díscolor** Bernh. Plants low, 1 to 1½ ft. high, more or less grayish-pubescent; leaves round-ovate, sinuately or laciniately few-toothed, 2 to 4 in. long; corolla white with indigo flush in throat, the limb with 5 slender subulate teeth; anthers white; capsule nodding.—Colorado Desert; e. to Ariz.; Mex.

3. **D. tátula** L. Purple Thorn-Apple. Plants 1 to 2 ft. high; stems purplish; corolla purplish; anthers purple, 2 lines long; capsule ovoid, with many very stout subequal prickles.—Nat. from trop. Am.; infrequent but widely distributed in the state.

4. **D. stramònium** L. Stramonium. Similar to the preceding, but the stems greenish and the flowers white; capsule with few prickles, the lower much shorter than the very stout upper ones which are ¾ in. long.—Introduced from trop. America and widely distributed in the state but infrequent. Also called Jamestown Weed and Jimson Weed.

2. PETÙNIA Juss.

Viscid herbs with small entire leaves, the upper disposed to be opposite. Flowers solitary in the axils. Calyx deeply 5-parted. Corolla funnelform. Stamens 5, conspicuously unequal, 2 long, 2 shorter and a fifth still shorter,

all inserted low in the corolla-tube. Hypogynous disk fleshy. Capsule ovoid, its valves elongating and separating from the partition. (Petun, an Indian name of tobacco.)

1. **P. parviflòra** Juss. Diffusely branched from the base, the stems 4 to 13 in. long, prostrate; leaves oblong-oblanceolate, 4 to 7 lines long; calyx-lobes linear; corolla purplish-red or purplish-blue, 2½ to 3 lines long, the lobes apiculate, the upper side with a white circular distended spot; fruiting calyx twice as long as the capsule; seeds reticulated.—Dried beds of pools and sandy stream bottoms: Santa Clara and Sacramento Cos. to Orange Co., thence to the Colorado River; e. to Tex. and Fla.; trop. Am.

3. NICOTIÀNA L. Tobacco

Heavy-scented usually viscid-pubescent herbs (except one) with entire leaves. Flowers in panicles or racemes. Calyx persistent, more or less investing the fruit, 5-toothed or -lobed. Corolla funnelform or salverform. Filaments filiform, mostly included. Ovary 2-celled, with large and thick placentae. Fruit a smooth 2-celled capsule, septicidal, and the valves promptly 2-cleft at apex, thus seeming as if 4-valved. Seeds small, numerous. (Jean Nicot, French diplomat and author of the most ancient dictionary in the French language, but more celebrated as having introduced tobacco into France from Portugal.)

Herbage glaucous; shrub; flowers yellow.....1. *N. glauca.*
Herbage viscid; annual herbs; flowers white to greenish.
  Leaves auricled at the sessile base; flowers open during the day...2. *N. trigonophylla.*
  Leaves petioled or sessile, rarely auricled; flowers open at night.
    Corolla-limb 3 to 5 lines broad.
      Calyx-lobes very unequal, the longer once to twice the length of the tube; leaves petioled or sessile.....3. *N. clevelandii.*
      Calyx-lobes subequal, shorter than the tube; leaves petioled..4. *N. attenuata.*
    Corolla-limb ¾ to 1 in. broad; leaves tapering into a petiole or sessile.....5. *N. bigelovii.*

1. **N. gláuca** Graham. Tree Tobacco. Soft-woody evergreen shrub 6 to 15 ft. high, very slender and loosely branching, with glabrous and glaucous herbage; leaves ovate, on petioles about half as long; flowers in terminal panicles; calyx unequally 5-toothed, 5 to 6 lines long; corolla 1½ in. long, its tube dilated above summit of the calyx, the stamens inserted at this point; throat of corolla constricted just below the short shallowly 5 (occasionally 4)-lobed limb; capsule oblong, ½ in. long. —Nat. from S. Am.: waste places about interior towns and along flood-beds of interior streams.

833. Nicotiana attenuata Torr.; *a*, fl. branchlet x ⅔; *b*, leaf x ½; *c*, corolla spread open x 1.

2. **N. trígonophýlla** Dunal. Slender, 1 to 3 ft. high; leaves broadly oblong to ovate, acute, sessile and auricled, 2 to 5 in. long, the lower ones attenuate at base into a shortly winged petiole; flowers in nearly naked racemes; calyx cleft nearly half way into lanceolate lobes, about half as long as the corolla; corolla cream-white, 8 lines long, its limb 3½ to 5 lines broad; filaments hairy at very base, inserted at middle of the tube.—Desert washes: Inyo Co.; Mohave and Colorado deserts; e. to Tex., s. to Mex.

3. **N. clevelándii** Gray. Habit and leaves of N. bigelovii; corolla 5 to 9 lines long, its limb 4 to 6 lines broad; filaments equally inserted low on the corolla-tube, glabrous or slightly puberulent towards the base. — Summer-dry stream-beds, 100 to 1500 ft.: coastal S. Cal., n. to Santa Barbara, e. to Colorado Desert.

4. **N. áttenuàta** Torr. COYOTE TOBACCO. Fig. 833. Stem branching, 2 to 4 ft. high; herbage glandular-pubescent, ill-smelling; lower leaves broadly ovate, the upper varying to narrowly lanceolate, all petioled; flowers many, racemosely or paniculately disposed along the branches, vespertine; calyx-teeth lanceolate to subulate, ⅓ to as long as the tube; corolla-tube 1 to 1½ in. long, with narrow limb 3 to 5 lines broad; filaments equally or only slightly unequally inserted low in the tube, pubescent below the middle; capsule longer or commonly shorter than the calyx.—Dry stream-beds and sandy flats or valley floors, 100 to 4000 ft., common throughout Cal., especially towards the interior; e. to Utah and Tex. July-Sept.

834. Nicotiana bigelovii Wats.: *a*, fl. branchlet x ⅔; *b*, leaf x ½; *c*, corolla-tube x 1.

5. **N. bigelòvii** Wats. INDIAN TOBACCO. Fig. 834. Stem commonly branching, 1½ to 2 ft. high; herbage with glandular indument, very ill-smelling; basal leaves oblong-ovate, acute, petioled, the cauline similar or lanceolate, sessile or tapering to a shortly winged petiole, or the lower distinctly petioled; flowers fewer than in N. attenuata, mostly scattered racemosely along the branches; calyx with slender teeth as long as the tube; corolla-tube 1½ in. long, the limb 1 in. wide; filaments unequally inserted high in the tube, glabrous; capsule obtuse, shorter than the calyx.—Flood-plains of rivers and open floors throughout the valleys and foothills; e. to Nev. and Ariz. This and N. attenuata were used by the Indians as a smoking tobacco; some of the tribes certainly cultivated these plants—their only strictly agricultural practice.

4. LÝCIUM L. DESERT THORN

Shrubs, ours rough-spiny. Leaves small, entire, usually narrow, commonly with smaller ones fascicled in the axils. Flowers white, pale violet or lavender, pediceled, solitary or fascicled in the axils or terminal. Calyx 5 (or 4)-toothed or -lobed, persistent beneath the globular or oblong berry. Corolla funnelform, with 5 (or 4) lobes. Stamens 5 (or 4). (The country Lycia, in Asia Minor.)

Ovary and fruit without sutures; corolla glabrous (or glabrous with a hairy margin in no. 4); stamens exserted or nearly so; filaments hairy or pubescent at base, inserted low on the corolla-tube.
- Corolla large, trumpet-shaped, its limb nearly as broad as the tube is long; calyx-lobes shorter than the tube; berry dull white or purplish.....1. *L. pallidum.*
- Corolla smaller, tubular-funnelform; berry red.
  - Leaves thick and fleshy, that is, pear-shaped but a little flattened.
    - Corolla-tube little or not at all exceeding the calyx; calyx-teeth ⅓ to ¼ length of the tube.....2. *L. californicum.*
    - Corolla-tube 2 to 3 times length of the calyx; calyx-teeth ⅙ length of the tube.....3. *L. andersonii.*
  - Leaves plane, not bulbous or pear-shaped; corolla-tube 1½ to 3 times length of the calyx.
    - Calyx-lobes ¼ to ⅓ as long as the tube.
      - Corolla 3 to 3½ times as long as the calyx, its lobes with a tomentulose margin; herbage mostly glabrous.....4. *L. torreyi.*
      - Corolla 1½ to 2 times as long as the calyx, wholly glabrous; herbage puberulent.....5. *L. fremontii.*
    - Calyx-lobes equaling or exceeding the tube.....6. *L. richii.*

Ovary and fruit with a horizontal suture on each side just above the middle; corolla puberulent, the sides of its lobes revolute; stamens included or almost wholly included in the tube; filaments inserted high in corolla-throat, their free portion glabrous.....7. *L. cooperi.*

835. Lycium pallidum Miers.; *a*, fl. branchlet x ½; *b*, leaf x ½; *c*, fl. x ¾; *d*, berry x 1.

1. **L. pállidum** Miers. TOMATILLA. RABBIT THORN. Fig. 835. Densely branched excessively thorny shrub, 1½ to 3 ft. high and as broad, the branchlets flexuous; herbage glabrous; leaves slightly glaucous, oblanceolate, ½ to 1 in. long (the lower leaves of young plants spatulate-obovate, 1 to 2½ in. long); flowers pendulous from the under side of the spreading branches; calyx less than half the length of the corolla, its lobes oblong, spreading, equaling or exceeding the calyx-tube; corolla narrowly bell-shaped, pure white to lavender, fading to pale yellow, 7 to 9 lines long, its limb 7 to 9 lines broad; stamens exserted; berry slightly depressed-globose, purplish or greenish white, glaucous, 4 to 6 lines broad.—Dry stony hills, 2000 to 3000 ft.: central Mohave Desert; e. to N. Mex. Mar.-Apr.

2. **L. californicum** Nutt. Glabrous shrub; leaves fleshy, 1 to 3 lines long; flowers whitish, mostly 4-merous; calyx-teeth ¼ to ⅓ length of tube; corolla 2 to 3 lines long, its limb nearly as broad, its tube not exceeding the calyx or only slightly.—Seacoast, Los Angeles Co. to San Diego Co.; s. to L. Cal. The leaves are often much thickened and as large as a grain of wheat.

3. **L. andersònii** Gray. WATER JACKET. Fig. 836. Intricately branched scraggly shrub with needle-like spines, 1 to 3 or 5 ft. high, usually glabrous; leaves spatulate or linear-spatulate, at least those of the fascicles pear-shaped but a little flattened, that is very thick and watery, 1½ to 3 or 6 lines long, on short almost filiform petioles ¼ to ½ line long; flowers 1 or 2 in a place, either 4 or 5-merous on same branchlet; calyx very small, ⅕ to ¼ length of corolla, its teeth almost minute; corolla white-lavender, aging buckskin-color, tubular-funnelform, glabrous (or the lobes very minutely ciliate), 4 to 6 lines long, the lower part of its tube about ⅓ line wide, the limb 2 to 2½ lines wide; stigma green; berry elliptic, 1½ to 2 lines long, red or at first chrome-yellow.—Dry stony hills, Mohave Desert, n. to Inyo Co.; e. to southern Nev. and Ariz. It is remarkable for its very small fleshy leaves, pear-shaped but a little flattened.

836. L. andersonii Gray; fl. x 1½.

837. Lycium torreyi Gray; *a*, fr. branchlet x 1; *b*, fl. x 1½.

4. **L. tórreyi** Gray. SQUAW THORN. Fig. 837. Roughish but often sparingly thorny erect shrub 4 to 8 ft. high; herbage mostly glabrous; leaves oblanceolate or oblong, mostly narrowed below to a short petiole-like base, ½ to 1¼ in. long; flowers mostly 3 to 7 in a fascicle; calyx-teeth minute, puberulent; corolla lavender-purple,

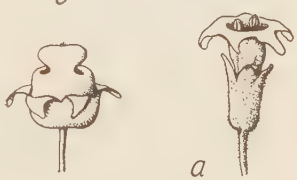
tubular-funnelform, 5 to 6 lines long; its rotately spreading lobes with a well-defined tomentulose margin; berry bright red, globose, 3 lines broad.—Along washes and dry stream-bottoms: Mohave Desert; e. to Tex. and Mex. Var. WRIGHTII Jepson n. comb. Very leafy-fasciculate, the leaves thin, plane, narrow-oblanceolate, ½ to 1 in. long.—Riverside and San Diego Cos.; e. to Ariz. (L. andersonii var. wrightii Gray.)

5. **L. fremóntii** Gray. Shrub 2 to 4 ft. high; leaves spatulate, ½ to ¾ in. long; herbage and calyx viscid-puberulent; calyx cylindric with short-triangular teeth; corolla pale violet, similar to L. torreyi, glabrous (or the lobes sometimes minutely ciliate); berry oblong to globose, 3½ to 4 lines long.—Colorado Desert; e. to Ariz.

6. **L. richii** Gray. Shrub 4 to 8 ft. high, the branches slender, pliable or some rigid and spinescent; herbage glabrous or minutely viscid-puberulent; leaves oblanceolate or spatulate, 2 to 6 lines long; calyx about half the length of the corolla, its lobes linear or lanceolate, acute, equaling or exceeding the tube; corolla funnelform, 4 to 5 lines long, its lobes about half the length of the tube; stamens a little exserted.—Santa Catalina Isl.; San Diego; s. to L. Cal.

L. PARISHII Gray. Similar to no. 6; herbage and calyx puberulent; calyx-lobes mostly ovatish and rather shorter than tube.—San Bernardino; Elsinore.

7. **L. cooperi** Gray. PEACH THORN. Fig. 838. Thorny compact densely leafy shrub 2 to 4 (or 6) ft. high, the branches and branchlets set mostly at right angles; bark smooth, whitish, or commonly dark red, in age black; herbage minutely pubescent and more or less viscid; leaves oblanceolate or oblong, narrowed to a short petiole, ½ to 1 in. long; calyx cylindric or in fruit enlarged and bowl-shaped, rather densely glandular-hispidulose with short spreading hairs, its broad lobes ½ to as long as the tube; corolla greenish-white, funnelform, minutely and rather weakly puberulent, rarely quite glabrous, 5 to 6 lines long, about twice the length of the calyx, its lobes rotate, later recurving, the sides revolute in such a way as to give a horn-like effect to each lobe; ovary with a horizontal sutural depression on each side above the middle; fruit short-cylindric or a little contracted at apex, subglobose, 3 to 4 lines high, hard or bony at maturity.—Desert mesas and mountain slopes, 2000 to 5000 ft.: Colorado Desert; Mohave Desert; Inyo Co.; e. to southern Nev.



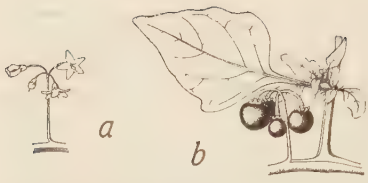
838. Lycium cooperi Gray; *a*, fl.; *b*, fr. x 1½.

5. SOLÀNUM L. NIGHTSHADE

Herbs or sometimes suffrutescent. Flowers in umbels on short lateral or terminal peduncles. Calyx 5-parted. Corolla rotate, 5-lobed, with scarcely any tube. Anthers almost sessile, lightly connate into a cylinder surrounding the style, opening by 2 small pores at the apex or longitudinally dehiscent. Fruit a berry with several seeds. (Latin name of the Nightshade, from solamen, quieting.)

Stems unarmed.
- Peduncles longer than the pedicels; corolla small, 5-cleft.
  - Annual; flowers 2 to 2½ lines broad ..... 1. *S. nigrum.*
  - Perennial; flowers 3 to 5½ lines broad ..... 2. *S. douglasii.*
- Peduncles much shorter than the pedicels or almost none, thickened into a cupulate node at the insertion of the pedicels; corolla larger, 5-angled or lobed, with greenish glands at base; perennial.
  - Leaves mostly hastate at base ..... 3. *S. tenuilobatum.*
  - Leaves not hastate.
    - Herbage viscidulous; hairs unbranched.
      - Leaves crenate; coastal ..... 4. *S. wallacei.*
      - Leaves entire; mostly of the interior ..... 5. *S. xantii.*
    - Herbage not viscid; leaves entire; hairs branched; coastal ..... 6. *S. umbelliferum.*

Stems armed with long straight prickles.
- Perennial; berry not enclosed in the calyx; calyx not prickly .... 7. *S. elaeagnifolium*
- Annual; berry wholly enclosed by the prickly calyx ..... 8. *S. rostratum*



839. Solanum nigrum L.; *a*, umbel; *b*, fr. branchlet. x ½.

1. **S. nigrum** L. Black Nightshade. Fig. 839. Low spreading annual, 1 to 2 (or 3) ft. across, dark green and glabrous, more or less conspicuously scabrous on the angles of the stem, otherwise quite smooth; leaves ovate to elliptic-ovate, acute, entire or sparingly and irregularly toothed or angulate-sinuate, 1 to 3 (or the very lowest 5) in. long; corolla whitish, aging purplish, 2 to 2½ lines broad, its segments oblong-lanceolate and ciliolate toward the apex; filaments and style pubescent; fruiting peduncles 6 to 11 lines long, bearing 3 to 5 berries on more or less recurved pedicels; berries blue-black, 2 to 3 lines in diameter, poisonous.—Nat. from Eur.: waste ground, commonly in shade or moist places, flowering through the summer into early winter.

S. villòsum Hill. Like no. 1 but villous and somewhat viscid; leaves small, conspicuously angular-dentate; berries yellow.—Santa Monica; adv. from Eur.

2. **S. douglásii** Dunal. Similar to S. nigrum, but perennial; herbage lightly puberulent; leaves triangular-ovate, shortly acuminate, 1½ to 2 in. long, on petioles ⅕ to ⅓ as long; corollas 3 to 7 lines broad; fruiting peduncles ¾ to 1¼ in. long; berries 3 to 4 lines in diameter.—Monterey Co. to coastal S. Cal., thence through the deserts to Death Valley and Ariz.

3. **S. tenùilobàtum** Parish. Stems woody at base, slenderly angled; herbage glabrate below, hirsutulous above; leaves linear to narrowly oblong, all except the uppermost linear-hastate at base; corolla 6 to 7 lines broad.—W. Colorado Desert.

4. **S. wallàcei** Parish. Bush, 2 to 3 ft. high, the stems with tawny viscid hairs; leaves thickish, cordate or the upper ovate, crenate; corolla 1 to 1¾ in. broad; berry dark purple.—Seacoast from San Luis Obispo Co. to Los Angeles Co.; Santa Barbara Isls. Var. víride Parish. Herbage glabrate, or hispidulous above.—Coast from Marin Co. to Monterey Co.

5. **S. xántii** Gray. Stems herbaceous, several to many from a woody root-crown, erect or decumbent, mostly simple, slender and sparsely leaved, 1½ to 2 ft. long; herbage typically gray-pubescent, sometimes green, the hairs simple, short, those of the stem spreading and somewhat viscid; leaves thinnish, elliptic-ovate, at base obtuse, truncate or subcordate, on petioles 2 to 7 lines long; flowers few in an umbel; corolla light azure or fading darker blue, 5 to 10 lines broad.—Foothills and mts., 100 to 4000 ft.: cismontane Cal.; w. side Mohave Desert. Var. intermèdium Parish. Leaves cordate or subcordate at base.—Coastal S. Cal. and n. to Sonoma Co. Var. glabréscens Parish. Leaves small, more or less attenuate at base, mostly narrow.—Throughout Cal.

840. Solanum umbelliferum Esch.; sect. of fl. branchlet x ⅔.

6. **S. umbellíferum** Esch. Blue Witch. Fig. 840. Stems more or less woody at base, deep green, mostly 5-angled or -ridged, 2 to 3 ft. high; herbage finely pubescent-tomentose, the hairs branched; leaves elliptic-ovate, rarely pinnatifid at base, 1 to 2 in. long or less, thickish, on petioles 2 to 3 lines long; peduncles short or almost none; corolla blue, sometimes white, 10 lines broad, shallowly 5-lobed with 5 pairs of greenish glands near the base; berry, when fully ripe, dull white with a greenish zone toward the base, 4 to 8 lines in diameter.—Hill country, especially along gulches or in cañons: Coast Ranges near the coast from Mendocino Co. to Santa Barbara Co. May-June, but often flowering at all seasons.

7. **S. elaeágnifòlium** Cav. Bull Nettle. Trompillo. Stem branching, 1 to 3 ft. high, prickles very slender, copious or wanting; herbage silvery-canes-

cent; leaves linear to oblong, entire or sinuate, 1¼ to 2 in. long, disposed to be somewhat conduplicate; calyx-lobes subulate, as long as the tube; corolla violet or blue; ovary white-tomentose; berry dull yellow; lower stamen much longer than the other 4.—Introduced from the Great Plains: Imperial Valley; Riverside; Los Angeles; San Pedro; Red Bluff.

8. **S. rostràtum** Dunal. BUFFALO-BUR. Stem erect, branched, ½ to 2½ ft. high; herbage stellate-pubescent; leaves pinnately but irregularly 5 to 7-lobed, the lobes entire or again 2 to 5-lobed; corolla yellow; calyx wholly enclosing the berry, densely prickly, the prickles long and slender.—Native of the Great Plains, locally adventive: Santa Monica; Los Angeles; Yreka.

6. CHAMAESARÀCHA Gray

Low perennial herbs, the stems few to several from the branched crown of a cord-like taproot. Leaves entire or pinnatifid, their petioles margined. Flowers 1 or 2 on axillary pedicels. Calyx herbaceous, neither ribbed nor angled, somewhat enlarged in fruit, closely investing the berry but open at the top. Corolla white or yellowish-white, rotate, 5-angulate, with 5 pairs of tomentose spots at base alternate with the stamens. Pedicels recurved in fruit, the berries hugging the ground or hiding against it. Seeds reniform, flattened, rugose or pitted. (Greek chamae, low, and Saracha, a Solanaceous genus of Cent. Am. and S. Am.)

841. Chamaesaracha nana Gray; *a*, habit x ⅓; *b*, anther x 2.

1. **C. nàna** Gray. Fig. 841. Stems 1 to 3, erect, 2½ to 4 (or 8) in. high; herbage puberulent; leaves ovate, acute, 1 to 2 in. long, rather abruptly tapering into petioles half to as long; peduncles shorter than the petiole; corolla white, with 5 large greenish spots at base, ¾ to 1 in. broad; fruiting calyx hemispherical, its teeth distinct, subulate; berry dull white or when fully ripe yellowish, 5 to 6 lines in diameter; seeds smoothish.—Sandy flats in the mts. or opens in pine woods, 5000 to 6000 ft.: e. slope Sierra Nevada from Nevada Co. to Siskiyou Co.; n. to southern Ore.

7. PHÝSALIS L. GROUND-CHERRY

Herbs with solitary axillary flowers. Corolla rotate from a short-campanulate base, yellow or yellowish, its limb 5-angled or 5-lobed. Stamens not connivent. Calyx in fruit membranous and bladdery-inflated, its teeth mostly connivent, completely and loosely enclosing the juicy berry. Seeds in ours smooth but finely pitted. (Greek, phusalis, a bladder, referring to the calyx.)

Annual; anthers commonly purplish or purplish-tinged.
- Herbage glabrous or nearly so, not viscid.
  - Corolla small (1 to 1½ lines broad) ..... 1. *P. lanceifolia.*
  - Corolla larger (5 to 7 lines broad).
    - Fruiting calyx shorter than the pedicels; corolla yellow without an eye ..... 2. *P. wrightii.*
    - Fruiting calyx much longer than the pedicel; corolla yellow with a purplish eye ..... 3. *P. ixocarpa.*
- Herbage not glabrous.
  - Stems and leaves puberulent ..... 4. *P. pubescens.*
  - Stems and petioles short-pilose ..... 5. *P. greenei.*

Perennial; leaves or some of them cordate; anthers commonly yellow.
- Pedicels shorter than the flowers; herbage with branched or stellate hairs ..... 6. *P. fendleri.*
- Pedicels long and filiform; herbage more or less minutely puberulent but without stellate hairs.
  - Herbage green and seemingly glabrous ..... 7. *P. crassifolia.*
  - Herbage grayish-pubescent ..... 8. *P. hederaefolia.*

1. **P. lánceifòlia** Ness. Similar to P. wrightii but the leaves narrower and less toothed; calyx-teeth triangular, shorter than the tube; corolla narrowly campanulate, 1½ lines broad.—Rare, Ft. Yuma; e. to Tex., s. to S. Am.

2. **P. wrightii** Gray. Eight to 13 in. high; herbage subglabrous; leaves coarsely or somewhat saliently toothed, 1 to 2½ in. long, on long petioles; calyx-teeth triangular-lanceolate, rather longer than the tube; corolla yellow, 5 to 6 lines broad, its tube glabrous; fruiting calyx ovate-globose, ¾ to 1 in. long, 10-nerved, equaling or somewhat shorter than the pedicels.—Rare, Colorado Desert; e. to Tex.

842. Physalis ixocarpa Brot.; *a*, fl. branchlet x 1; *b*, stamen x 2½; *c*, fr. calyx x 1.

3. **P. ixocárpa** Brot. TOMATILLO. Fig. 842. Much-branched, 1½ to 2 ft. high, the stems angular; herbage glabrous or the younger parts finely pubescent; leaves ovate, toothed or a few sub-entire, ½ to 2½ in. long; flowers on very short (1 to 1½ lines long) pedicels; calyx-teeth short-triangular; corolla lemon-yellow, with 5 brown spots towards base, its limb rotate, ½ in. broad, its tube short and open, very hairy with white hairs which conceal 5 shallow pits alternating with the purple filaments; fruiting calyx globose-ovate, ¾ to 1¼ in. long, little angled.—Orchard weed, nat. from Mex.: s. San Benito Co.; Ojai Valley; Pomona; San Bernardino; Winchester.

4. **P. pubéscens** L. HUSK TOMATO. Slender, diffuse, pubescent throughout or at least the stems scantily soft-pubescent; leaves thin, ovate, apiculate, nearly entire, often equaling the petioles; calyx-teeth lanceolate, equaling the tube; corolla 3 to 5 lines broad, yellow with dark center; fruiting calyx exceeding its pedicel.—Introduced from the se. U. S.: Ft. Yuma; Visalia.

843. Physalis crassifolia Benth.; *a*, fl. branchlet; *b*, fr. calyx x ⅔.

5. **P. gréenei** Vasey & Rose. Erect-spreading, 1 to 1½ ft. high; herbage viscid, the stems and petioles short-pilose, the blades puberulent; pedicels about 1 in. long; flowers 5 lines long; calyx-teeth acute or acuminate, ⅔ as long as the tube; corolla greenish-yellow; fruiting calyx globose-ovate, the angles hispidulose.—Rare in coastal S. Cal.: Elsinore; Ysidora; s. to L. Cal.

6. **P. féndleri** Gray var. **cordifòlia** Gray. Similar to P. crassifolia; pubescence or most of it branching; leaves cordate-ovate, 1 to 2½ in. long; pedicels shorter than the flowers; calyx-teeth ⅓ to ½ as long as the tube, acute; fruiting calyx globose-ovate.—Providence Mts., e. Mohave Desert; e. to southern Utah.

7. **P. crassifòlia** Benth. Fig. 843. Stem diffusely branching, forming plants 1 to 3 ft. broad and ½ to 1 ft. high; herbage minutely puberulent; leaves broadly ovate, ½ to 1 (or 1½) in. long, repandly few-toothed or entire, mostly truncate or subcordate at base and usually with one side decurrent on the petiole; pedicels 2 to 3 times length of flower; calyx-teeth triangular-acute, ¼ to ⅓ as long as the tube; corolla pale buckskin-yellow, with recurving limb 6 to 7 lines broad, its tube exceeding the short-cylindric calyx and with 5 hairy bands at summit, one opposite each lobe; filaments with branched spreading hairs; fruiting calyx 1 to 1¼ in. long.—Washes or cañon beds, rather common in the desert ranges: Death Valley; e. Mohave Desert; Colorado Desert; s. to Mex.

8. **P. hedéraefòlia** Gray. Stem branching, 8 to 10 in. high; herbage finely pubescent (or "viscid-pubescent"), somewhat grayish on the young parts; leaves ovate, subentire to sinuate-toothed; pedicels shorter than the flowers; calyx-teeth lanceolate, as long as the tube.—E. Mohave Desert: New York Mts.; Leastalk; e. to Tex.

SCROPHULÀRIÀCEAE. Figwort Family

Ours herbs excepting Diplacus and some species of Pentstemon and Castilleia. Leaves simple, entire or toothed, rarely parted or pinnatifid. Flowers complete. Stamens 4, in 2 pairs (one pair shorter than the other), or one pair sterile, or stamens 2 only, always inserted on the corolla. Verbascum has 5 perfect stamens and in several genera the fifth stamen is present as a sterile filament or rudiment. Corolla commonly 2-lipped (sometimes nearly regular and 4 or 5-lobed); upper lip 2-lobed or with a snout-like, hooded or hooked prolongation (galea); lower lip 3-lobed, frequently 3-saccate. Calyx synsepalous or sometimes chorisepalous. Ovary superior, 2-celled; style 1; stigma 2-lobed or entire. Fruit a 2-celled, 2-valved capsule, with septicidal or loculicidal dehiscence, or opening near the apex by pores; seeds numerous or often few, with a minute mostly straight embryo in abundant endosperm.—An interesting family biologically, the species in California numerous, many of them the showiest of West-American plants.

A. Anther-bearing stamens 5; leaves alternate.

Corolla nearly regular, rotate, with short tube; filaments (or some of them) very hairy.—Tribe Verbasceae.....1. Verbascum.

B. Anther-bearing stamens less than 5.

1. Corolla with a spur or sac at base of tube on lower side or gibbous at base, often with a prominent palate (see also genus 11, no. 16); capsule opening near the apex, usually by pores or chinks.—Tribe Antirrhineae.

Stamens 4, all with anthers.
Corolla-tube with a sac at base; palate closing the throat.....2. Antirrhinum.
Corolla-tube with a spur at base; palate seldom closing the throat.....3. Linaria.
Stamens 2, their anthers borne under the arched ridge of the upper lip.....4. Mohavea.

2. Corolla without spurs or sacs at base of tube, 2-lipped to nearly regular; capsule valvate.

a. Upper lip of corolla not galeate; leaves opposite (except no. 20), or the upper sometimes alternate.

Stamens with anthers 4; fifth stamen present as a sterile filament, scale, or mere gland.—Tribe Cheloneae.
Annuals; fifth stamen present as a rudiment or gland.
Corolla strongly declined, strongly 2-lipped; middle lobe of lower lip folded lengthwise into a sac enclosing the stamens and style.....5. Collinsia.
Corolla minute, little declined, the lobes rotately spreading; some cauline leaves ternately divided or parted.....6. Tonella.
Perennials.
Corolla short, inflated, with 4 lobes erect and 1 reflexed; sterile stamen reduced to a scale adnate to upper lip.....7. Scrophularia.
Corolla tubular, from strongly to obscurely 2-lipped; sterile filament conspicuous, about equaling the fertile ones.
Seeds not winged; anthers woolly or glabrous.....8. Pentstemon.
Seeds with a broad membranous wing; anthers woolly.....9. Chelone.
Stamens 4 or 2; fifth stamen wholly absent.
Leaves opposite, at least the lower.
Corolla 2-lipped (3 lobes in lower lip, 2 in upper) or subregular and 5-lobed.—Tribe Gratioleae.
Stamens 4, all with anthers (except no. 12); corolla 2-lipped.
Calyx tubular or campanulate, 5-toothed.

Corolla tubular or funnelform, often elongated.
Calyx 5-angled, plicate-carinate or prismatic.
Shrubs ..... 10. DIPLACUS.
Herbs ..... 11. MIMULUS.
Calyx not prismatic, slightly 5-sulcate; stamens 4, 2 fertile; annual ..... 12. MIMETANTHE.
Corolla open-campanulate; stems creeping, bearing tufts of leaves and flower-scapes; diminutive annual... 13. LIMOSELLA.
Calyx 5-parted or -divided.
Stems erect or ascending; anther-cells separate and stipitate..... 14. STEMODIA.
Stems creeping; anther-cells united..... 15. BACOPA.
Stamens with anthers 2; sterile pair present or none; corolla tubular, little or not at all 2-lipped; calyx of 5 almost distinct sepals.
Corolla-lips nearly equal; sterile filaments short or none.. 16. GRATIOLA.
Lower lip of corolla larger than upper; sterile filaments forked..... 17. ILYSANTHES.
Corolla 4-lobed, little or not at all 2-lipped; calyx 4-parted.—Tribe VERONICEAE.
Stamens 4, 2 sterile; corolla broadly campanulate; leaves in a basal tuft.... 18. SYNTHYRIS.
Stamens 2; corolla subrotate; leaves mainly cauline..... 19. VERONICA.
Leaves alternate; flowers in a one-sided raceme; stamens 4.—Tribe DIGITALEAE..... 20. DIGITALIS.

b. Upper lip of corolla galeate.—Tribe EUPHRASIEAE.

Anther-cells unequal, separated; leaves alternate.
Calyx 2-cleft or 4-cleft; bracts mainly with colored tips.
Calyx tubular, cleft before and behind; upper lip of corolla long and narrow, very much longer than the small 3-toothed lower lip; perennials except two ..... 21. CASTILLEIA.
Calyx tubular-campanulate, 4-cleft; upper lip of corolla narrow, not so greatly or not at all exceeding the inflated 3-saccate lower lip; annuals except three ..... 22. ORTHOCARPUS.
Calyx of 2 distinct divisions, or the upper division wanting; corolla lips of nearly equal length; bracts never colored; annuals..... 23. CORDYLANTHUS.
Anther-cells equal, parallel and approximate.
Leaves opposite; calyx campanulate, deeply cleft before and behind; anther-cells mucronate; annuals.
Corolla white and pink; anther-cells near margins densely short-hairy; lateral calyx-lobes notched..... 24. BELLARDIA.
Corolla yellow; anthers pilose; lateral calyx-lobes deeply divided..... 25. PARENTUCELLIA.
Leaves alternate or basal; calyx narrowly campanulate, cleft in front, sometimes behind, unequally 2 to 5-toothed; anther-cells not mucronate; perennial herbs ..... 26. PEDICULARIS.

1. VERBÁSCUM L. MULLEIN

Usually biennial herbs with tall virgate stems and alternate leaves. Flowers ephemeral, in spikes or racemes. Calyx 5-parted. Corolla rotate, with 5 nearly equal segments, ours commonly yellow. Stamens 5, all with anthers; all of the three posterior filaments woolly-bearded. Stigma undivided or bilamellate. Capsule septicidally 2-valved, the valves cleft at apex and the septa parting from the persistent axis, releasing many pitted or roughened seeds. (Corrupted from Barbascum, the old Latin name.)

Plants very woolly; flowers sessile..... 1. *V. thapsus.*
Plants with green herbage; flowers pediceled.
Flowers usually solitary; pedicels longer than calyx..... 2. *V. blattaria.*
Flowers clustered; pedicels not longer than calyx..... 3. *V. virgatum.*

1. **V. thápsus** L. COMMON MULLEIN. Stout, densely woolly, 3 to 6 ft. high; basal leaves 6 to 12 in. long, obovate-lanceolate or -oblong; cauline leaves oblong, entire or crenate, crowded, the stem winged by their very decurrent bases; flowers in a very long dense simple spike; spike 1 to 3 ft. long, 1¼ in. thick, sometimes with one to several short spikes at base; lower filaments mostly naked; seeds pitted, the pits in rows.—Flats, valleys, mountain ridges or dry stream beds, nat. from Eur.: very common in the Sierra Nevada pine belt; North Coast Ranges.

2. **V. blattária** L. MOTH MULLEIN. Slender, 2 to 4 ft. high; herbage green and glabrous, the inflorescence glandular-pubescent; leaves not decurrent, 4 in. long or less; upper leaves ovate or ovate-lanceolate, dentate, cordate-clapsing; lower leaves oblong, more coarsely toothed or pinnatifid, the basal ones narrowed to a short winged petiole; flowers yellow or white, 1 in. broad, in a long loose simple raceme; pedicels longer than the calyx; filaments all bearded with violet woolly hairs.—Foothills and valleys throughout Cal., not common; nat. from Eur.

3. **V. virgàtum** Stokes. Simple or branching above, 3 to 4 ft. high; herbage pubescent, the raceme glandular; leaves lanceolate, sessile, clasping, crenate, 1½ to 3 in. long, the lower oblong-lanceolate, coarsely crenate or pinnately cleft, 6 to 12 in. long, petioled; spike interrupted, the bracts small; pedicels often in 2s or 3s, not longer than the linear or lanceolate calyx-lobes; otherwise very like a taller form of no. 2.—Roadsides and waste places near Los Angeles, nat. from Eur., not common: Alhambra; Eagle Rock Valley; Pomona; Sierra Madre; El Monte.

2. ANTIRRHÌNUM L. Snapdragon

Annual or perennial herbs. Leaves opposite or whorled, the upper usually alternate. Flowers in terminal racemes or solitary in the upper axils. Corolla gibbous or saccate at base on lower side; palate often closing the throat. Fertile stamens 4, the filaments often dilated toward apex, the fifth stamen commonly represented by a gland. Capsule dehiscing by irregular apertures or pores at the base of the style; style deciduous or persistent. (Greek anti, like, and rhinon, nose, because of the snout-like flowers.)

A. Perennials.

Shrubby; persistent style bent backwards.....1. *A. speciosum.*
Not shrubby; persistent style straight or bent forwards.
Stems climbing by slender tortile petioles and axillary peduncles; sepals equal, longer than the globular capsule; flowers scattered, on long peduncles; corolla 6 to 10 lines long, the prominent palate nearly closing the orifice; style straight..
2. *A. maurandioides.*
Stems erect, in no way climbing; sepals unequal; flowers racemose-spicate; corolla 6 to 7 lines long, the palate closing the orifice; style bent forward.
Glabrous throughout; leaves linear or linear-lanceolate; racemes more or less secund, the flowers discrete or nearly so; lower pair of filaments with dilated tips.....3. *A. virga.*
Glandular-pubescent and viscid throughout; leaves lanceolate; racemes dense, not secund; filaments all moderately dilated upwards.4. *A. glandulosum.*

B. Annuals.

Stems erect, in no way climbing; calyx-segments equal; style persistent, indurated, stout at base .....5. *A. cornutum.*
Stems climbing.
Peduncles filiform, elongated, naked, prehensile, the plant climbing exclusively by them; calyx-segments about equal; style persistent or deciduous; capsule equal or nearly so; stems very slender with remote leaves.
Stems often nearly simple; calyx and outside of corolla glabrous; corolla violet-purple, gibbous at base; style persistent, straight.....6. *A. strictum.*
Stems at length much-branched; calyx and outside of corolla somewhat pubescent; corolla yellow or white, saccate at base; style deciduous, or if persistent, much curved.....7. *A. filipes.*
Axillary branchlets slender, tortile (the plant climbing by means of them); calyx-segments unequal; persistent style or its base bent forward.
Glabrous up to the inflorescence; flowers in a spike or dense raceme; bracts minute or lacking; 3 upper sepals slightly longer than the others.....
8. *A. coulterianum*
Usually somewhat hirsute or pubescent below; flowers scattered to densely racemose, but leafy-bracteate; upper sepal longer than the others.
Nearly glabrous above, hairy at base; leaves narrowly lanceolate to linear; Inyo Co.....9. *A. kingii.*
More or less pubescent throughout; leaves lanceolate or ovate to oblong-ovate.
Corolla-tube gibbous or gibbous-saccate at base; seeds longitudinally cristate-costate; S. Cal. .....10. *A. nuttallianum.*
Corolla-tube saccate at base; seeds not cristate-costate.
Leaves acute or obtuse at apex.
Stems slender; leaves alternate, dark green, acute or obtuse at base; upper sepal 2 to 4 lines long; common...
11. *A. vagans.*
Stems stout; leaves mainly opposite, light green, subcordate or nearly so at base; upper sepal 4 to 6 lines long, very conspicuous and leaf-like; rare.....
12. *A. subcordatum.*
Leaves mostly retuse and with a corneous spot at apex, sessile or nearly so; rare.....13. *A. ovatum.*

1. **A. speciòsum** Gray. Evergreen shrub 3 to 8 ft. high, not climbing, glabrous below, hairy at nodes, pubescent above; leaves opposite or in 3s, oval to oblong, obtuse or acutish, mucronate, coriaceous, 1 to 1⅓ in. long, shortly petioled; sepals lanceolate, nearly equal, 4 lines long; corolla scarlet, pubes-

cent, tubular, saccate, 3 times as long as the sepals, its lips about equal, ⅓ the length of the tube; palate prominent, but not closing the throat; filaments hairy at base, dilated above; gland lobed; capsule opening by irregular perforations at apex; seeds costate, the ribs winged.—Santa Catalina and San Clemente islands.

2. **A. maurandioides** Gray. Stems very slender, 1½ to 2½ ft. long, climbing by petioles and peduncles; herbage glabrous; leaves alternate, triangular-hastate or the lower cordate-hastate, the lateral lobes often with a posterior tooth; sepals lanceolate, acute; corolla purple or sometimes white, 6 to 10 lines long, hairy within, gibbous at base; fertile stamens with filaments dilated above, hairy especially at base, the fifth stamen with short filament and abortive anther; seeds corky-ribbed.—Providence Mts., e. Mohave Desert.

3. **A. virga** Gray. Stems erect, virgate, several from the base, 2½ to 5 or 7 ft. high; leaves linear to linear-lanceolate, sessile, 2 to 3½ in. long; flowers red-purple in a mostly secund raceme, with subulate bracts; sepals ovate, acute moderately unequal, scarcely ½ the length of the corolla; corolla purple, 6 to 7 lines long, the sac at base mammaeform; filaments all geniculate at the very base and all hairy, especially at the geniculation, the gland truncate.—Mountain ridges, 2000 to 3000 ft., in chaparral or chamise: Miyakma and Napa ranges and e. to Mt. Konocti. The known stations are few.

4. **A. glandulosum** Lindl. Stems several from the root-crown, stout, woody at base, 3 to 5 ft. high, very leafy; leaves lanceolate, sessile, 1 to 2½ in. long, those of the short lateral sterile shoots mostly linear, about half as long, gradually diminishing into the bracts of the inflorescence; bracts commonly conspicuous; sepals oblong-lanceolate, the posterior one equaling, the others shorter than the oblong corolla-tube, this 4 to 5 lines long, saccate near base; corolla pink, pubescent without and within, 6 to 9 lines long; upper lip parted into two lobes, the lobes turned backward so as to be conduplicate; palate yellow, forming a prominent inverted sac; filaments geniculate at base, hairy especially at geniculation, dilated above; gland small, capitate; seeds closely and irregularly fimbrillate-cristate.—Mountain slopes, 2000 to 4000 ft.: Santa Cruz and Santa Lucia mountains; San Gabriel and San Bernardino mountains; central Sierra Nevada foothills in Calaveras and Tuolumne Cos.

5. **A. cornutum** Benth. Simple or branching, 12 to 15 in. high, viscid-villous; leaves linear-oblong or oblanceolate, obtuse, 1 in. long, the lower petiolate; flowers axillary, sessile or nearly so; sepals not longer than the ovate-globular capsule; corolla 3 to 4 lines long, yellowish or purplish, the sac prominent, the lips nearly equaling the tube, the palate glandular, hairy; filaments nearly glabrous, dilated at apex, the longer strongly so and curved; gland small, capitate.—Infrequent or rare: inner North Coast Ranges from Napa Co. to Shasta Co., thence s. in the Sierra Nevada foothills to Mariposa Co. Var. **venosum** Jepson n. var. Stem 6 to 12 in. high, simple or much branched, more slender, very floriferous; herbage glandular-villous; leaves smaller and narrower; flowers 3½ to 4½ lines long, solitary in the axils of all the leaves; corolla dull white, closely purple-veined, a thickly glandular-hairy band extending from the palate into the throat; filaments somewhat hairy on one side.—N. Napa Co. to w. Lake Co. (Scott Valley, Tracy 2377, type).

6. **A. strictum** Gray. Stem 1 to 2 (or 3) ft. high, erect, simple or branching, often becoming weak and lax and climbing by tortile filiform peduncles, hairy below, the herbage otherwise glabrous: lowest leaves ¾ to 1¼ in. long, often filiform, ¼ to ½ as long as the peduncles; calyx-segments linear-lanceolate, little unequal; corolla violet-purple, 5 to 6 lines long, the hairy prominent palate nearly closing the throat; filaments dilated above; gland small, acute; fruiting calyx about equaling the crustaceous capsule; the style of equal length.—Near the coast, Marin Co. to San Diego Co. Mar.-May.

7. **A. filipes** Gray. Stems hairy below, similar to but more slender than in A. strictum, 2 to 4 ft. high, climbing by filiform peduncles 2 to 3 in. long; lower leaves ovate or oblong, the upper linear to lanceolate; corolla ½ in. long, with saccate base and hairy palate, bright yellow (in depauperate specimens small, white); early flowers often cleistogamous; filaments some-

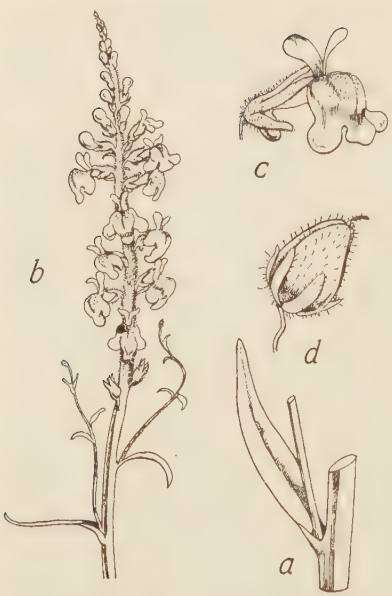
844. Antirrhinum coulterianum Benth.; *a*, infl. x ½; *b*, leaf x ½; *c*, fl. x 1½; *d*, capsule x 2.

what dilated upwards; gland minute; capsule nearly membranous; seeds with corky-winged ribs.—Colorado Desert; n. to the central Mohave Desert. Apr.-May.

8. **A. còulterià̀num** Benth. Fig. 844. Stems erect, 1½ to 4 ft. high, glabrous below the inflorescence; basal leaves narrowly ovate, ¾ to 1¼ in. long, petioled, the cauline linear or lanceolate, shortly petioled or sub-sessile, distant; raceme rather loose, spike-like, virgate, naked or with minute bracts, often producing tendril-like branchlets, villous-pubescent, viscid and sometimes glandular; calyx 2 lines long, exceeding the pedicels, the segments linear or lanceolate; corolla 4 to 5 lines long, purplish to white with yellowish hairy palate; palate prominent but not closing throat; lower lip broad, 3 to 4 lines long, at least twice as long as the upper; upper lip deeply lobed, the lobes rounded, divergent; corolla-tube longer than the calyx, gibbous at base, the gibbosity almost as broad as the tube, obtusely conical and slightly directed upwards; filaments all dilated upwards; gland minute; style persistent, bent forward at base; seeds tuberculate-favose.—Foothills and valleys, Los Angeles Co. to San Diego Co. Var. NEVINIÀNUM Jepson n. comb. Seeds longitudinally cristate-costate.—Coast of Orange Co. (A. nevinianum Gray.)

9. **A. kíngii** Wats. Slender, erect or somewhat twining, 9 to 12 in. high, more or less hairy at base, above nearly glabrous, lower leaves narrowly linear to narrowly lanceolate, ½ to 1 in. long; upper leaves minute; calyx somewhat glandular, at length equaled or exceeded by pedicels; corolla white, purple-veined, 2 to 3 lines long, the tube slightly gibbous at base, ½ the length of the posterior sepal and about equaling the others, the throat closed, the lips small, about equal; longer pair of filaments dilated upwards; gland minute; style persistent, short, subulate; capsule globular, slightly oblique; seeds favose-tuberculate.—Cañons in the desert, 3000 to 5000 ft.: Inyo Co.; e. through Nev. to Utah.

10. **A. nuttálliànum** Benth. Stem simple or at length much-branched and diffuse, 1 to 3 ft. high; herbage viscid-pubescent or glabrous below; leaves broadly ovate to subcordate, ½ to 1 (or 2) in. long, mostly petiolate; pedicels slender, the lower somewhat tortile, often longer than the flowers; corolla blue or violet, with a white blue-reticulated spot on lower lip; lower lip somewhat longer and much larger than upper lip, broadly oblong, emarginate, erect but with the sides turned backward; corolla-tube 2 to 3 lines long, equaled by the posterior sepal, gibbous at base; palate closing throat, very prominent, with two hairy lines running down into throat; filaments somewhat dilated above; gland minute or lacking.—Coastal S. Cal., 100 to 2000 ft.: s. slope foothills of the San Gabriel and San Bernardino mountains; s. to San Diego Co. Var. EFFÙSUM Gray. Stems slender, climbing by tortile leafy branchlets, 4 to 5 ft. high; peduncles filiform, mostly twice as long as the leaves; ribs of seeds less wing-like.—Cismontane S. Cal. Var. SUBSÉSSILE Jepson n. comb. Stem erect, stout, somewhat branched but less diffuse; leaves ½ in. long, ovate, sessile or nearly so; peduncles shorter than the flowers, sometimes shorter than the calyx; earlier flowers white, scarcely exceeding the calyx; cleistogamy common.—Cismontane S. Cal. (A. subsessile Gray.)



845. Antirrhinum vagans Gray; *a*, leaf x ½; *b*, fl. branchlet x ⅓; *c*, fl. x 1½; *d*, capsule x 2½.

11. **A. vàgans** Gray. Fig. 845. Stem at first simple and erect, at length branching and very diffuse, the branches ½ to 1½ ft. long; branchlets slender; herbage varying greatly from copiously to sparingly glandular-hirsute; leaves ovate, mostly 3 to 5 lines long, oblong to lanceolate and mostly ¼ to 1 in. long, the uppermost (especially those of the prehensile branchlets) reduced and 1 line long or less; calyx-segments very unequal, linear, except the large uppermost one, this oblong or elliptic-oblong, 2 to 4 lines long, nearly equaling the corolla-tube; corolla purple to whitish, 4½ to 6 lines long, the lips not strongly unequal, the palate glandular-pubescent, the tube saccate or shortly spurred; filaments dilated at apex; gland obtuse; style slender, as long as the capsule; seeds muriculate-roughened or muriculate-reticulate to fimbrillate-favose. — Open or brushy slopes in the foothills, 500 to 2500 ft.: Eldorado Co. to Tuolumne Co.; Coast Ranges from Lake Co. to Los Angeles Co. Var. RIMÒRUM Jepson n. var. Lower part of stem with spreading white bristles; raceme dense, secund; seeds densely muriculate.—Morrison Cañon, Niles (Jepson, type). Var. BRÈWERI Jepson. Slender and less diffuse, the leaves linear-oblong to ovate, ½ to 1 in. long; raceme often secund; corolla smaller (3 to 5 lines long), considerably exceeding the less unequal sepals.—North Coast Ranges from Napa and w. Solano Cos. to Siskiyou Co., thence s. in the Sierra Nevada foothills to Tuolumne Co. July-Sept.

12. **A. subcordàtum** Gray. Stems stout, 2½ to 3 ft. high, climbing by prehensile axillary branchlets (these commonly sterile and nearly naked), white-bristly below, glandular hispid above and on the branchlets; leaves mainly opposite, broadly ovate, mucronate, entire, entirely glabrous (or very sparsely ciliate at base), 1 to 1¼ in. long, subsessile, the lowermost alternate and petioled; flowers in a dense but somewhat interrupted leafy-bracteate spike-like raceme (or a few solitary in the lower axils and on the branchlets); pedicels 1 to 2 lines long, becoming somewhat elongated in fruit; calyx-lobes hispid, unequal, the posterior 4 to 6 lines long, leaf-like, the others 3½ lines long, subulate-lanceolate, nearly equaling the tube of the corolla; corolla 6 to 7 lines long, hairy without and within, the tube 4 lines long, saccate at base, longer than the lips; upper lip shallowly 2-lobed, surpassed by the lower; filaments hairy at base, the shorter pair slightly, the longer pair much dilated towards the apex, the anthers free or either or both pairs connivent; sterile stamen represented by a small somewhat lobed capitate gland; capsule unequal-sided, the style persistent, bent downward; seeds numerous, favose-fimbrillate.—Foothills, w. side Sacramento Valley in Glenn and Colusa Cos.

13. **A. ovàtum** Eastw. Simple or branching, ½ to 1½ ft. high, glandular-hairy; leaves ovate, 5 lines long, obtuse or retuse, with a glabrous corneous spot at apex; flowers axillary on short peduncles; posterior calyx-segment large, oblong, leaf-like; corolla 6 to 9 lines long, the tube somewhat curved, prominently saccate at base, throat open, the upper lip pink, the lower white; stamens with filaments dilated above, free or the longer pair connivent; gland somewhat capitate.—E. San Luis Obispo Co.

A. EMÁRGINÀTUM Eastw. Apparently close to no. 13; upper leaves induplicate, the notch at apex subtended by a peculiar gland forming a gusset (ex char.).—Fresno.

3. **LINÀRIA** Juss.

Annual herbs. Lower leaves opposite and the upper alternate, entire in ours. Flowers in terminal racemes. Calyx 5-parted. Corolla 2-lipped, its tube with a lower spur at base on the lower side; upper lip erect; lower lip spreading, its prominent palate sometimes closing the throat, the middle lobe the smallest. Stamens 4. Capsule dehiscing below the summit by pores or slits, many-seeded. (Name derived from Linum, flax.)

1. **L. canadénsis** Dum. TOAD FLAX. Annual or biennial; flowering stems one or several, erect, 6 to 18 in. high; leaves linear, mostly alternate or the lower ones and especially those of the procumbent basal shoots opposite or whorled and often broader; racemes loose; pedicels erect, short; corolla blue, 1 to 2 (or 4) lines long, the spur 2 lines long, upper lip greatly exceeding the lower.—Sandy soil, rather uncommon, but widely scattered through the state; N. Am., S. Am.

4. **MOHÀVEA** Gray

Annual with lanceolate leaves. Flowers solitary in the axils on short pedicels but the internodes short and so forming a dense leafy spike. Sepals lanceolate, distinct. Corolla pale cream-yellow, much exceeding calyx, with very short tube and very ample limb which is somewhat campanulate and seemingly 2-petaled, but really composed of two fan-shaped lips; upper lip distinctly 2-lobed, lower lip shallowly 3-lobed, its strongly inflated but small palate with a central elevated yellow short-hairy crest and a depression either side of it. Stamens 2, connivent by their anthers over the curved tip of the style, all under the arched ridge of the upper lip. Capsule thin-chartaceous, the equal cells bursting irregularly at apex. (Named for the Mohave River where collected by Capt. Fremont.)

Corolla pale cream-yellow, its lobes erose-denticulate ..... 1. *M. confertiflora.*
Corolla lemon-yellow, its lobes mostly entire ..... 2. *M. breviflora.*

1. **M. confértiflòra** (Benth.) Hel. Erect, 3 to 13 in. high, simple or branching, viscid-pubescent; leaves opposite or the upper alternate, tapering to base, acuminate at apex, entire, 1 to 2½ in. long; sepals 5 lines long; corolla 10 to 14 lines long, both lips penciled with fine dots in lines; capsule 5 to 6 lines long; seeds with a flattish crest or margin on back and an involute wing forming a cavity on the ventral side.—Rocky desert slopes, 500 to 2500 ft.: Colorado Desert; e. Mohave Desert. Apr.-May. (Antirrhinum confertiflorum Benth. Mohavea viscida Gray.)

2. **M. breviflòra** Cov. Two to 5 in. high; leaves narrowly ovate, attenuate, ¾ to 1½ in. long; corolla sulphur-yellow, 6 to 9 lines long, less dotted than in no. 1; palate pubescent over its entire surface.—Inyo Co.

5. **COLLÍNSIA** Nutt.

Annuals with simple opposite leaves. Flowers whorled, forming a raceme, or axillary and scattered. Calyx campanulate, 5-cleft. Corolla declined (the proper tube very short and the abruptly expanded or gibbous throat forming an angle with it), deeply 2-lipped; upper lip 2-cleft, with erect lobes; lower lip larger, 3-lobed, the middle lobe conduplicate or keel-shaped and enclosing the 4 declined stamens and style. Filaments long and filiform, the lower pair inserted higher on the corolla than the others; the gland at base of corolla represents the fifth stamen. Capsule septicidal, the valves soon 2-cleft. (Zaccheus Collins, American botanist, of Philadelphia, 1764-1831.) The corolla is a striking imitation of the papilionaceous type.

A. Flowers short-pediceled or almost sessile, crowded in whorl-like clusters.

Filaments (commonly only the upper pair) and often the interior of corolla bearded.
Calyx-lobes acute, upper lip of corolla nearly as long as the lower, the saccate throat oblique to the tube ..... 1. *C. bicolor.*
Calyx-lobes somewhat obtuse; upper lip of corolla short.
Herbage staining brownish; saccate-ventricose throat forming a right angle with the tube of the corolla ..... 2. *C. tinctoria.*

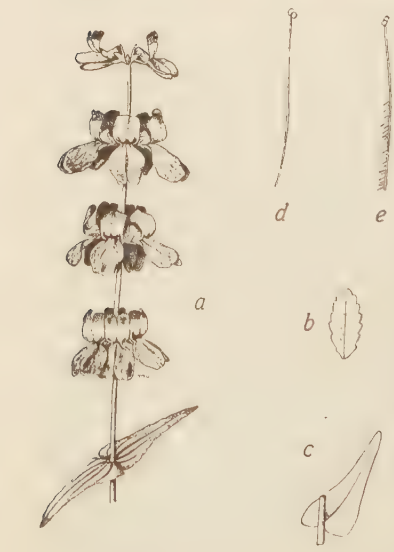
Herbage not staining brownish.
Stem commonly strict and erect; flower-clusters 2 to 5; upper corolla-lip conspicuous ..... 3. *C. bartsiaefolia.*
Caespitose, branching from base and diffuse or decumbent; flowers mainly in a solitary capitate cluster; upper corolla-lip almost obsolete..... 4. *C. corymbosa.*

Filaments beardless or nearly so.
Glabrous; calyx-tube and lower portion of calyx-lobes white; lower corolla-lip equaling the upper; interior of corolla-tube somewhat bearded..... 5. *C. davidsonii.*
Glandular-puberulent; calyx uniformly green; lower corolla-lip about twice as long as the upper; interior of corolla-tube glabrous..... 6. *C. greenei.*

B. Flowers long-pediceled, solitary or the upper in whorls.

Filaments (commonly only the upper pair) hirsute.
Herbage minutely viscid-pubescent above; upper leaves ovate or ovate-lanceolate; flowers 8 to 12 lines long..... 7. *C. franciscana.*
Herbage glabrous or slightly puberulent, not at all viscid; upper leaves oblong or linear; flowers 3 to 6 (or 8) lines long..... 8. *C. sparsiflora.*
Filaments glabrous (the upper pair in nos. 11 and 12 sometimes slightly hairy).
Inflorescence not glandular or viscid.
Calyx nearly equaling corolla, lobes of the latter entire..... 9. *C. parviflora.*
Calyx scarcely more than ½ length of corolla, lower lobes of the latter retuse or emarginate.
Calyx-lobes broadly subulate; flowers 6 to 9 lines long; seeds smooth..... 10. *C. grandiflora.*
Calyx-lobes obtuse; flowers 3 to 4 lines long; seeds reticulate... 11. *C. parryi.*
Inflorescence glandular or viscid.
Cauline leaves oblong to acutely ovate; calyx broad and square at base, the lobes acute ..... 12. *C. callosa.*
Cauline leaves linear to oblong-lanceolate; calyx roundish at base, the lobes acute or obtuse.
Leaves thinnish, the cauline oblong or oblong-lanceolate, mostly obtusely serrate; corolla-throat longer than lips, these about equal. 13. *C. childii.*
Leaves thickish, the cauline linear or oblong-linear, mostly entire; corolla-throat shorter than lower lip, this surpassing the upper..... 14. *C. torreyi.*

1. **C. bicolor** Benth. CHINESE HOUSES. Fig. 846. Simple or branching from the middle, ½ to 1½ ft. high, glabrous or finely pubescent and often viscid above; leaves broadly oblong, or the upper with the broad base narrowed to the apex, serrulate, 1 to 2 in. long; pedicels shorter than the oblong-acute or lanceolate calyx-lobes; corolla rather less than 1 in. long, with lower lip violet or rose-purple, the upper lilac or white, a little shorter than the lower, the lobes recurved-spreading and with low but distinct crests at the point of junction with the tube; saccate throat very oblique to the tube, bristly within, usually with 3 longitudinal purple lines beneath each lobe of the upper lip; whole corolla sometimes varying to white; gland conical; seeds reticulate-rugose, about 6 in each cell.—Very common in the edges of woods in the foothills, 50 to 2800 ft., throughout cismontane Cal. from San Diego Co. to Tulare, Calaveras, Shasta and Humboldt Cos. Apr.-June. Var. CÓNCOLOR Jepson n. comb. Leaves linear or oblong-linear; calyx-tube hoary with long villous arachnoid pubescence, the segments obtuse; flowers smaller.—San Diego Co. (C. concolor Greene.)



846. Collinsia bicolor Benth.; *a*, infl. x ⅔; *b*, lower leaf x ⅔; *c*, cauline leaf x ⅔; *d*, stamen of lower pair x 2½; *e*, stamen of upper pair x 2½.

2. **C. tinctòria** Hartw. Fig. 847. Stems stoutish, simple or diffusely branching, ½ to 2 ft. long; herbage glandular-viscid above, at least on the branches, and imparting a brownish stain; lower leaves oblong to lanceolate, with short petioles, the upper ovate or triangular-lanceolate, sessile by a broad or subcordate base, serrate or entire, 1 to 3 or 4 in

long; calyx-lobes linear or oblong, obtuse; corolla white to yellowish, declined a little below the horizontal; upper lip very short with 2 transverse purple lines and a transverse ridge or crest; lower lip with longitudinal pencilings or lines; throat as broad as long, very strongly saccate-ventricose, forming a right or obtuse angle with the tube; upper pair of filaments bearded on upper side; gland conical; seeds small, smoothish.—Wooded hillsides, 500 to 3700 ft.: Sierra Nevada from Shasta Co. to Kern Co.; Napa and Hoods Peak ranges to Mt. Diablo. June. The herbage gives an iodine-like stain to the hands. Var. STRÍCTA Jepson n. comb. Stem slender; foliage and flowers smaller than in the species; segments of upper lip of corolla very acute and replicate as well as reflexed. —Calaveras Co. foothills. (C. stricta Greene.)

847. Collinsia tinctoria Hartw.; *a*, infl. x ½; *b*, corolla x 1½; *c*, stamen of upper pair x 2½; *d*, stamen of lower pair x 2½.

3. **C. bártsiaefòlia** Benth. Stem erect, 4 to 9 in. high; herbage finely puberulent and often glandular; leaves thickish or even fleshy, ovate or ovate-oblong to linear, about 1 in. long; flower-clusters 2 to 5; calyx usually white-villous, its lobes broad and obtuse; corolla whitish, the lower lip tinged with lilac or purple, less declined than in no. 1, the upper lip with few purple lines or dots above, about the length of the curved gibbous throat, with a transverse callous crest or ridge at its origin; lateral lobes of the lower lip often emarginate or obcordate; upper portion of throat of corolla pubescent inside; upper pair of filaments bearded on the upper side to the middle or above; gland sessile and elongated. —Sands near the seashore: Mendocino Co. to San Francisco and s. to S. Cal.; also San Joaquin Valley. Apr.-June.

4. **C. corymbòsa** Herder. Stems several from the base, diffuse, 2 to 5 in. high; herbage almost glabrous; leaves oblong or oval, rather fleshy; corolla straightish, white or yellowish, its upper lip blue or bluish, the lobes almost obsolete; lobes of lower lip entire; gland small, short-stipitate; seeds 4 or 5 in each cell, rugose-reticulated.—Central Mendocino coast.

5. **C. davidsónii** Parish. Stem erect or ascending, 4 to 8 in. high, cymosely few-branched; leaves ovate or oblong; calyx-tube and lower portion of the obtuse lobes white; upper lobe of corolla pale blue or nearly white, transversely callous, the ample lobes few-toothed; lower lip with lateral lobes violet, keel white with dark tip; filaments beardless or the upper pair often somewhat bearded; gland stipitate; capsule not surpassing calyx-lobes; ovules 4 in each cell; seeds rugose.—Antelope Valley, w. Mohave Desert.

6. **C. grèenei** Gray. Stem slender, diffusely branched, 6 to 8 in. high; herbage puberulent below, glandular-puberulent above; leaves linear, or tapering to apex, entire or obscurely dentate; pedicels sometimes as long as the calyx; corolla deep azure-blue; upper lip much shorter than the oblong throat, about half the length of the lower, and very prominently wing-crested or toothed at its origin; lateral lobes of lower lip small; gland small; filaments glabrous.—Rocky places in the North Coast Ranges, 2000 to 5000 ft., from ne. Sonoma Co. to Lake and Humboldt Cos. June.

7. **C. franciscàna** Bioletti. Stem simple or branching, ½ to 1½ ft. high, erect or reclining on other plants; leaves 1 to 2 in. long, oblong or ovate to lanceolate, coarsely toothed, the lower or lowest roundish, entire, dentate or

848. Collinsia sparsiflora F. & M.; *a*, fl. branchlet x 1; *b*, lower leaves x 1; *c*, fl. x 1½.

3-parted; pedicels of varying length; calyx-teeth acute or obtuse, the tube with 2 linear-oblong submembranous spots below each lobe; upper lip of corolla white, purple-spotted at base, throat longer than wide, closed; gland subulate; seeds rugulose.—San Francisco and San Mateo Cos.

8. **C. sparsiflòra** F. & M. Fig. 848. Stem slender, branched from near the base, 4 to 18 in. high; herbage subglabrous or slightly puberulent, reddish; lowest leaves elliptical, 3 to 9 lines long, with 1 or 2 teeth on each side, on petioles nearly as long, the upper oblong to linear, remotely serrate or entire, ¾ to 1¼ in. long, becoming gradually sessile; corolla 4 to 6 lines long; upper lip bluish or sometimes yellowish at base, purple-dotted at throat, hardly shorter than the lower lip; lateral lobes of lower lip purple; upper lip with an evident transverse ridge or crest; keel sometimes yellowish externally, more or less pilose-pubescent; upper pair of filaments pubescent on the upper side; gland conical or somewhat elongated; seeds concave on one side and convex on the other, acutely margined, about 2 in each cell.—Common in low fields or in wet places on hillsides, 50 to 2000 ft.: Coast Ranges from Santa Clara Co. to Siskiyou Co., thence se. in the Sierra Nevada foothills to Placer Co. Apr.-May. Var. ARVÉNSIS Jepson. Seven to 12 in. high; nearly glabrous except the setulose-hairy leaves and minutely setulose-ciliate calyces; corolla 6 to 8 lines long.—Grainfields: Lake, Sonoma and Marin Cos.

9. **C. parviflòra** Dougl. Diffuse or spreading, 3 to 9 in. high; herbage minutely puberulent; leaves commonly lanceolate, varying to oblong or oblong-oblanceolate, mostly entire (or remotely denticulate), mostly 1 to 1½ (1½ to 1⅝) in. long, the floral often in whorls of 3 to 5; pedicels solitary or, above 2 to 5 in a whorl, usually longer than the flowers; calyx-lobes lanceolate and acute, or triangular-subulate, hardly longer than the mature capsule; corolla blue or partly white, the oblong gibbous throat longer than the limb; gland small, short-stipitate; seeds thickish, marginless.—Montane, 4500 to 8500 ft.: San Jacinto Mts.; Sierra Nevada from Tulare Co. to Shasta Co.; North Coast Ranges, 2500 to 4500 ft., from Humboldt Co. to Siskiyou Co.; n. to B. C., e. to Ariz. and Ont. Var. COLLÍNA Jepson n. var. Leaves small (3 to 6 lines long), narrow, mostly crenate; calyx-teeth spinulose-ciliolate.—Nevada Co. foothills (Penn Valley, Jepson, type).

10. **C. grandiflòra** Dougl. Stem erect, branching, 6 to 15 in. high; herbage minutely puberulent, as also the pedicels, the calyces glabrous; lower leaves rounded, serrate or entire, 4 to 6 lines long, petioled, the upper oblong to linear, entire, ¾ to 1¾ in. long, sessile; flowers in whorls of 3 to 8; calyx-tube commonly whitish or membranous, the lobes broadly subulate; corolla 5 to 8 lines long, white or purple with lower lip deep blue or violet; saccate throat as broad as long; upper lip 2-callous; lobes of the larger longer lower lip retuse or emarginate; capsule shorter than calyx.—Montane, 1500 to 4000 ft.: Plumas Co. to Modoc Co.; Mendocino Co. to Humboldt Co.; n. to B. C. and Ida. Var. PUSÍLLA Gray. Small form, 6 to 8 in. high; corolla 4 to 5 lines long, more blue or violet throughout.—Weaverville, Trinity Co.

11. **C. párryi** Gray. Stem erect, simple or branched from base, 7 to 13 in. high; herbage puberulent; leaves 7 to 12 lines long, the upper lanceolate or linear, obtuse, mostly entire, sessile, the lower ovate or oblong, crenate, petiolate; pedicels as long as flowers, much elongated in fruit; calyx-

lobes equaling throat of the deep blue corolla, also equaling or slightly exceeding the capsule; lips of corolla almost equal, the lobes emarginate.—Foothills on the s. side of the San Gabriel and San Bernardino mountains. June.

12. **C. callòsa** Parish. Stem stout, erect, branched, 4 to 11 in. high; herbage glabrous, the inflorescence glandular-puberulent; leaves ovate to linear-oblong, mostly entire, somewhat revolute, subcordate at the sessile base or shortly petioled, ½ to 1½ in. long; flowers solitary or in 2s or 3s; corolla light blue, 2 to 4 lines long, the lips about equaling the moderately gibbous throat, the lobes entire and equal, the lower lip with prominent internal folds or callosities below the sinuses; gland filiform; capsule shorter than calyx-lobes.—Montane, 2500 to 6500 ft.: desert ranges of Inyo Co.; Sierra Nevada (Inyo and Kern Cos.) and sw. to the mts. of Ventura Co. and the San Gabriel Mts.

13. **C. childii** Parry. Stem erect, branching, 4 to 12 in. high, subglabrous or puberulent below, glandular-pubescent above; lower leaves obovate-rotund or oblong, 3 to 12 lines long, the upper oblong-lanceolate with narrowed base, 1 to 2¼ in. long; inflorescence glandular-pubescent; calyx-lobes lanceolate or oblong, obtuse; corolla 2 to 3 lines long, light blue or whitish lilac, its lobes of about equal length and entire or emarginate.—Montane, 5000 to 6000 ft.: s. Sierra Nevada in Tulare and Kern Cos.; San Bernardino and San Antonio mountains; s. to Cuyamaca Mts. The herbage stains brown.

14. **C. tórreyi** Gray. Stem erect, simple or usually widely branching, 2 to 11 in. high, puberulent below, glandular above; upper leaves linear to lanceolate, entire or serrulate, narrowed at base, (½ or) 1 to 2½ in. long, the lower spatulate or oblong and petioled; flowers in whorls of 3 to 6, the pedicels glandular; calyx lobes linear, obtusish; corolla 3 to 3½ lines long, deeply blue or violet, rather strongly declined, 3 times the length of the calyx; upper lip equaling, the lower longer than the ventricose throat; seeds 1 in each cell, smooth.—High montane, 3000 to 8000 ft.: Sierra Nevada; high North Coast Ranges. Var. LINEÀRIS Jepson n. comb. Larger, ½ to 1 ft. high; cauline leaves 1½ to 3 in. long; calyx-lobes acute; flowers dull white or light blue, 5 lines long, the lips longer than throat and tube; ovary-cells 3-ovuled.—N. Humboldt Co. and n. to southwestern Ore. (C. linearis Gray.) Var. RATTÁNII Jepson n. comb. Eight to 12 in. high; cauline leaves 6 to 14 lines long; calyx-lobes broad, lanceolate, obtusish; corolla violet, 3 lines long, lips equal to throat and tube; gland subulate; cells of ovary with 1 to 3 ovules; capsule equaling calyx; seeds meniscoidal, margined.—Humboldt Co. (C. rattanii Gray.) Var. WRÌGHTII Jtn. Three or 4 in. high; leaves linear, oblong or lanceolate, entire, 1 to 1½ in. long; flowers axillary or the uppermost in a naked umbel; calyx 2 lines long, lobes obtusish; corolla but little longer, the tube and throat shorter than the lobes, the lower lip blue, the upper yellowish; capsule equaling or shorter than the calyx, 2-seeded; seeds oblong, nearly terete with a deep ventral sulcus.—San Antonio Mts.; Mt. Pinos; Sierra Nevada from Kern Co. to Mariposa Co. (C. wrightii Wats.) Var. BRACHYSÌPHON Jepson n. comb. Simple, 1½ to 2½ in. high; cauline leaves linear-lanceolate, about 1 in. long; calyx-lobes obtuse, about twice the length of tube; corolla small, the throat twice as long as wide; lateral divisions of lower lip almost twice as long as keel; gland sessile; capsule slightly longer than calyx; seeds 2.—Mt. Lassen to Placer Co. (C. brachysiphon Eastw.)

6. **TONÉLLA** Nutt.

Slender branching annuals. Leaves opposite, entire, dentate or ternately divided. Flowers small, almost like those of Collinsia. Corolla scarcely declined, in ours 2-lipped; lower lip consisting of one somewhat fanshaped lobe; upper lip of 4 equal oblong lobes, the lateral ones narrower. Filaments thickened upward, the upper third microscopically glandular. Fifth stamen represented by a small gland. Seeds 1 to 4 in each cell. (Origin of name unknown.)

1. **T. tenélla** (Benth.) Hel. Stem erect, branching, almost filiform, 5 to 12 in. high; leaves heteromorphic, the lowest rotund to ovate, entire or with a deep notch on each side near the apex, 2 to 4 lines long, on petioles longer than the blade, the upper palmately 3-parted or -divided into oblong segments, the middle segment longest; bracts entire, shorter than the pedicels;

849. Scrophularia californica Cham.; *a*, leaf x ⅓; *b*, infl. x ½; *c*, fl. x 2; *d*, upper lip x 2.

pedicels in 2s or 3s, as much as 1 in. long; corolla minute, little exceeding the calyx, white or very pale blue, the lobes of some of them with a few purple dots; lower lip slightly concave; capsule exceeding the calyx; seeds 1 to each cell.—Openly wooded slopes, 500 to 2700 ft.: Santa Clara Co. to Siskiyou Co., thence se. to Butte Co.; n. to Ore. Mar.-Apr. (T. collinsoides Nutt. Collinsia tenella Benth.)

7. SCROPHULÀRIA L. Figwort

Rank perennial herbs with opposite leaves. Flowers small, dull reddish, cymose, the cymes disposed in a narrow terminal panicle. Calyx 5-parted into broad lobes. Corolla with a somewhat globular tube, the two upper lobes longer than the two lateral, all erect except the short deflexed lower one. Stamens with anthers 4, the fifth sterile and adnate to the tube of the corolla, appearing like a scale under the upper lip. Capsule septicidal, many-seeded. (Latin scrofulae, the plant a one-time remedy for scrofula.)

1. **S. califórnica** Cham. Fig. 849. Tall, 3 to 6 ft. high, glabrous except the finely glandular-pubescent inflorescence; leaves ovate, cordate at base, serrate or incised-serrate; corolla about 4 lines long, with a nectar-disk at base of flower.—Moist slopes or along gulches in the hills, 100 to 6000 ft.: throughout Cal.; Nev. to Ore. May-June. Var. FLORIBÚNDA Greene. Panicle with very flexuous branches.—Dry hills, w. Solano Co. Var. CATALÌNA Jepson n. var. Stout, 4 or 5 ft. high; upper parts viscid, densely clothed with long glandular hairs.—Santa Catalina Isl. (T. Brandegee, type). Var. LACINIÀTA Jepson n. var. Rather stout; stems and leaves pubescent; leaves ovate or ovate-lanceolate, deeply cut into laciniate divisions, these sharply serrate.—Tehachapi Valley (Davy 2158, type); Riverside.

8. PENTSTÈMON Mitch.

Perennial herbs or suffrutescent plants of hilly districts. Leaves opposite, the upper sessile. Flowers mostly showy, in racemes, panicles, or cymes. Calyx 5-parted. Corolla tubular and often inflated, the limb either slightly or strongly 2-lipped; upper lip 2-lobed, the lower 3-cleft. Stamens with anthers 4, declined at base, ascending above; fifth stamen represented by a conspicuous sterile filament which is often dilated or bearded. Capsule septicidal (the valves cleft at apex through the persistent base of the style), many-seeded. Seeds angled. (Greek pente, five, and stemon, stamen.)

A. Anther-cells joined at apex, soon spreading or divaricate, slit from the base to apex or ⅓ the way to apex, when completely slit the anther-cells confluent and soon explanate.

I. Anthers densely long-woolly; low but woody at base, the leaves coriaceous.

Corolla blue or lavender; upper lip with the anther pairs well concealed under it, its lobes divergent; throat open; leaves mostly entire; var. davidsonii of . . . 1. *P. menziesii.*

Corolla crimson; upper lip with the anthers well-protruded or exserted, its lobes parallel; throat narrow; leaves mostly serrate . . . . . 2. *P. newberryi.*

II. Anthers glabrous or slightly hairy, never long-woolly.

1. Filaments all bearded and pubescent at base; anthers glabrous; shrubs or bushes.

Corolla red, tubular, the lips much shorter than the long and narrow tube. Leaves in opposite pairs.

Sterile filament densely bearded above; leaves mostly subcordate at base.....
3. *P. cordifolius.*
Sterile filament bearded its whole length; leaves acute or subacute at base.....
4. *P. corymbosus.*
Leaves chiefly in whorls of 3; sterile filament bearded.....5. *P. ternatus.*
Corolla yellow or yellowish or white, the widely spreading lips longer than the short tube.
Flowers in a panicle; corolla strongly gaping.
Sterile filament not bearded; upper lip of corolla longer than tube.
Corolla pinkish-white; upper lip strongly arched with a small apiculation or minute tooth on the back below the notch, not constricted below apex; leaves ¾ to 2¾ in. long.....6. *P. breviflorus.*
Corolla yellow; upper lip inarched, slightly notched, constricted a little beneath the apex; leaves 3 to 8 lines long.....7. *P. antirrhinoides.*
Sterile filament densely bearded above; upper lip of corolla shorter than tube....
8. *P. lemmonii.*
Flowers solitary in the axils of the reduced upper leaves; corolla not gaping, the lips shorter than the narrow tube.....9. *P. rothrockii.*

2. Fertile filaments not bearded at base, the upper pair sometimes obscurely puberulent at base.

a. Flowers ¾ to 1½ in. long, commonly borne in a strict narrow or racemose panicle; herbage glabrous.

Anther-cells slit from base to apex, the cells confluent at apex.
Corolla strongly or at least markedly 2-lipped.
Pedicels and calyx glandular-puberulent; leaves narrowly ovate to lanceolate or oblong, dentate or denticulate.
Upper leaves broadly sessile.
Corolla-tube shorter than calyx or scarcely (½ to 1 line) longer, abruptly and conspicuously campanulate-inflated into a very wide throat; sterile filament densely bearded; corolla white or purplish or pink-tinted.....10. *P. palmeri.*
Corolla-tube longer than calyx; sterile filament glabrous; leaves glaucous; corolla pink or pink-red.....11. *P. floridus.*
Upper leaves cordate-clasping; corolla-tube shorter than calyx.12. *P. rattanii.*
Pedicels and calyx glabrous and non-glandular.
Leaves ovate or oblong, serrate (except the lower), connate-perfoliate; sterile filament glabrous; corolla red-purple.....13. *P. spectabilis.*
Leaves linear or narrow-oblanceolate, entire, not connate-perfoliate; sterile filament hairy; corolla white or pale pink.....14. *P. fruticiformis.*
Corolla nearly regular or at least not markedly 2-lipped, red or scarlet, its lobes short, roundish, subequal.
Leaves sharply dentate, the upper or some of them commonly connate-perfoliate.
Corolla 8 to 9 lines long; sterile filament hairy, rarely glabrous; w. side Colorado Desert .....15. *P. clevelandii.*
Corolla 11 to 13 lines long; sterile filament glabrous; e. side Colorado Desert.
16. *P. pseudospectabilis.*
Leaves all distinct, entire; sterile filament glabrous; leaves ovate to lanceolate, entire or serrulate.
Corolla scarlet, tubular; abundant.....17. *P. centranthifolius.*
Corolla red, narrow, the throat funnelform-dilated; uncommon.18. *P. parishii.*
Anther-cells slit towards but not quite to apex.
Corolla red.
Sterile filament with a tuft of bristles at apex; corolla barely 2-lipped.....
19. *P. eatonii.*
Sterile filament glabrous; corolla strongly 2-lipped.....20. *P. labrosus.*
Corolla blue or blue-purple; sterile filament bearded or not bearded.....21. *P. glaber.*

b. Flowers 5 to 8 lines long, glomerate, the glomerules more or less whorl-like.

Leaves entire.
Apex of leaves not mucronulate.
Sepals green or greenish.
Herbage glabrous; pedicels and calyx glabrous; calyx-lobes scarious-margined and denticulate or lacerate.
Flowers sessile or nearly so in dense whorls; sterile filament bearded; herbage green; high montane, common.....22. *P. confertus.*
Flowers on pedicels 1 to 4 lines long, in loose whorls; sterile filament glabrous; herbage glaucous; deserts, rare in Cal.....
23. *P. acuminatus.*
Herbage densely or minutely cinereous, the inflorescence viscid-villous; sepals glandular-pubescent, narrowly lanceolate-attenuate, in age glabrate and finely lineate longitudinally; sterile filament densely yellow-hairy at least half-way to base.
Inflorescence 3 to 6 in. long, leafy-bracteate; corolla 6 to 8 lines long...
24. *P. divergens.*
Inflorescence ½ to ¾ in. long, with small bracts; corolla 4 to 6 lines long .....25. *P. calcareus.*
Sepals with narrow scarious or white margins; sterile stamen glabrous; deserts.
Leaves conspicuously white-margined.....26. *P. albomarginatus.*
Leaves wholly green; var. thurberi of.....27. *P. ambiguus.*
Apex of leaves mucronulate; herbage cinereous; sterile filament bearded; var. californicus of .....28. *P. linarioides.*

Leaves dentate or denticulate.
Corolla yellowish or dull white; sterile filament glabrous; herbage and inflorescence glabrous, sometimes pilose .....29. *P. deustus.*
Corolla purple-blue; sterile filament hairy or glabrous; herbage glabrous; inflorescence glandular-puberulent.....30. *P. ovatus.*

B. Anthers sagittate or horseshoe-shaped, the cells joined at apex and there dehiscent by a slit which extends only ½ to ¾ the way down the cells, the lower or basal portion remaining closed or saccate, never woolly, sometimes hairy; margins of anther-cells denticulate or ciliate, unchanged in position (not becoming divaricate); leaves all entire.

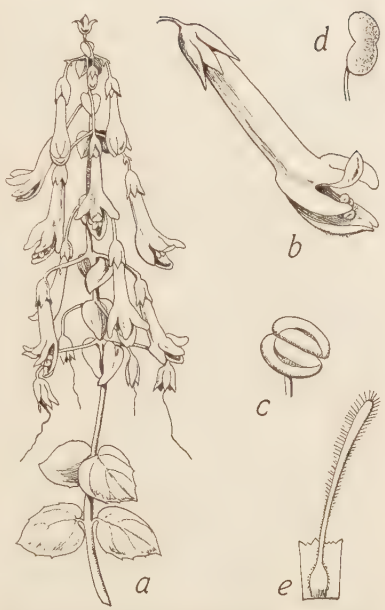
Sterile filament lightly bearded; corolla blue, slender-funnelform, moderately 2-lipped, 6 lines long; inflorescence viscid-pubescent.....31. *P. gracilentus.*
Sterile filament glabrous; corolla ventricose-funnelform, strongly 2-lipped, 9 to 15 lines long
Corolla blue to purple.
Inflorescence glandular-pubescent.
Leaves 3 to 8 times as long as broad; herbage, or at least the stems, finely cinereous-puberulent; flowers in an open panicle....32. *P. laetus.*
Leaves, at least the lower, broader than long or nearly as broad as long.
Herbage glabrous and glaucous; panicle open, broad.....33. *P. caesius.*
Herbage densely canescent; panicle racemose.....34. *P. purpusii.*
Inflorescence not glandular; panicle racemose.
Herbage glabrous and blue-glaucous; middle cauline leaves commonly very much unlike those of the sterile basal shoots....35. *P. jaffrayanus.*
Herbage minutely cinereous-puberulent, sometimes glabrous; leaves all essentially alike .....36. *P. heterophyllus.*
Corolla scarlet-red, tubular-funnelform, very strongly 2-lipped.....37. *P. bridgesii.*

1. **P. menziesii** Hook. var. **davidsonii** Piper. Stems prostrate, forming a leafy mat from which arise the leafy-bracted peduncles; peduncles 1 to 2 (or 4 or 5)-flowered, the flowers spreading horizontally; basal leaves ovate and obtusish, or the lowest orbicular, entire, glabrous, 2 to 5 lines long, on short petioles; sepals lanceolate, glandular-puberulent, 4 to 5 lines long; corolla blue-purple, 1¼ to 1½ in. long, its lobes very short, its throat ventricose on the lower side, a hairy band running down from middle lobe of lower lip; upper lip recurving, lower lip erect (extended in direction of tube); sterile filament densely bearded at tip, much shorter but not "half-shorter" than the other filaments; anthers long-woolly. —High montane, 7000 to 12,000 ft.: Sierra Nevada from Tulare Co. to Lassen Co.; Siskiyou Co.; e. to western Nev., n. to Wash. (P. davidsonii Greene.)

850. Pentstemon newberryi Gray; *a*, fl. branchlet x ½; *b*, stamen x 2; *c*, sterile filament x 2.

2. **P. newbérryi** Gray. MOUNTAIN PRIDE. Fig. 850. Stems simple, arising from a woody base, 8 to 20 in. high; leaves orbicular to round-ovate, serrulate, coriaceous or elliptic, ¾ to 1¼ in. long; racemes short, sessile or rather short-peduncled; sepals narrowly lanceolate; corolla crimson or bright red, 1 to 1⅛ in. long, its lips nearly equal; upper lip erect, the lower with equal recurving lobes; lower lip with two densely bearded folds; anthers slightly exserted, densely woolly; sterile filament bearded at apex.—Montane, on rocky ledges, 4000 to 10,000 ft.: Mt. Shasta to Lassen, Nevada and Tulare Cos.; North Coast Ranges. June-July. (P. sonomensis Greene. P. newberryi var. sonomensis Jepson.)

3. **P. cordifòlius** Benth. Fig. 851. Stems long and straggling, 3 to 8 ft. long, half-climbing over shrubs, very leafy; leaves ovate, subcordate or truncatish at base, serrate, veiny, ½ to 1 or 2 in. long, on short slender petioles or sessile; panicle short and leafy, mostly 1-sided, its branches short, horizontal or declined; sepals ovate-lanceolate; corolla scarlet, tubular, 1¼ to 1½ in. long; upper lip erect, notched, nearly ½ as long as the tube; lower lip spreading, cleft to the middle, the lobes dilated at tip; filaments flattened with narrow-oblong dilations at base, the dilations short-hispid on the margins; sterile filament densely bearded above on one side. — Cañons and hill slopes, 500 to 2000 ft.: coastal S. Cal. from San Luis Obispo and Ventura Cos. to San Diego Co.; Santa Barbara Isls.; s. to L. Cal.



851. Pentstemon cordifolius Benth.; *a*, fl. branchlet x ⅓; *b*, fl. x 1; *c*, anther before dehiscing x 3; *d*, anther after dehiscing x 3; *e*, sterile filament x 1½.

4. **P. corymbòsus** Benth. Stems 10 to 16 in. high, arising from depressed or low shrubby evergreen mats; herbage glabrous except the glandular-pubescent inflorescence; leaves oblong and acute at both ends or narrowly ovate or the lower obovate, denticulate or entire, ¼ to 1¼ in. long, short-petioled; flowers in terminal corymbs; sepals linear or somewhat narrowed above; corolla scarlet, tubular, 2-lipped, 1 to 1¼ in. long; lower lip abruptly spreading, 3-parted into oblong lobes, the upper lip erect, 2-cleft; filaments all pubescent at the very base, the sterile one bearded its whole length on one side.—Rocky ledges and cliffs, 500 to 5000 ft.: Coast Ranges from Mt. Hamilton Range, Santa Cruz Mts., Lake Co. and Mendocino Co. to Shasta and Siskiyou Cos. (P. intonsus Hel.) Var. PUBERULÉNTUS Jepson n. var. Leaves tending to be elliptic; herbage puberulent. — Butte Co. (Richardson Sprs., Hall 6763, type).

852. Pentstemon breviflorus Lindl.; *a*, fl. branchlet x ½; *b*, fl. x 1; *c*, anther x 3; *d*, sterile filament x 1½.

5. **P. ternàtus** Gray. Straggly bush 4 to 6 ft. high, the flowering stems virgate, arising from the older woody base; herbage, pedicels and calyx glabrous, the stems glaucous; old bark fissured into long narrow deciduous strips; leaves linear-lanceolate (or the lowest ovate), serrulate, ¾ to 2 in. long, subsessile, borne in 3s, except the lower; flowers in an elongated raceme-like thyrsus; corolla terra-cotta color, or pale scarlet, tubular, 1 in. long, 2-lipped, the lips 2 to 3 lines long; upper lip erect, shortly notched; lobes of the lower lip linear-oblong or ovate,

spreading; fertile filaments bearded at base; sterile filament densely bearded along its whole upper side.—Montane, 1500 to 7000 ft.: San Diego Co. to the San Jacinto, San Bernardino and San Gabriel mountains; n. to the southern Sierra Nevada in Kern Co. Aug.

6. **P. breviflòrus** Lindl. Fig. 852. Stems simple, elongated, from a branched woody base, 3 to 6 ft. high; herbage glabrous and glaucous, the pedicels, calyx and corolla glandular-pubescent; leaves lanceolate, oblong-lanceolate, or linear, denticulate (or the lowest entire), ¾ to 2¾ in. long; panicle ample, 6 to 9 in. long; sepals ovate, acuminate, 2 lines long; corolla 6 to 7 lines long, white with pinkish marking, deeply 2-lipped, the upper lip oblong, erect, galeate, notched (with a small reflexed tooth in the notch), longer than the tube, beset with viscid hairs; lower lip with widely spreading oblong lobes; filaments approximate in center so as to close tube, glabrous, abruptly dilated at base, the dilation oblong, densely hispidulose-margined above; sterile filament glabrous; stamens exserted.—Dry hills, 1000 to 6500 ft.; inner Coast Ranges from Ventura and San Luis Obispo Cos. to Shasta Co., thence s. in the Sierra Nevada to Tulare Co.; e. to western Nev.

853. Pentstemon antirrhinoides Benth.; *a*, fl. branchlet x ½; *b*, fl. x 1; *c*, anther x 5; *d*, sterile filament x 2.

854. Pentstemon lemmonii Gray; *a*, lower leaves x ½; *b*, infl. x ½; *c*, fl. x 1; *d*, anther x 3; *e*, sterile filament x 1½.

7. **P. antirrhinoides** Benth. Fig. 853. Much-branched evergreen shrub 1 to 8 ft. high; herbage minutely puberulent or subglabrous; leaves linear or oblong, 3 to 8 lines long, on a short but slender petiole; panicle ample, leafy; sepals round-ovate, acute; corolla yellow, very broad, 9 to 10 lines long, strongly gaping, its tube short and broad, shorter than the lips; upper lip erect, cleft, strongly incurved-arched, very slightly notched; lower lip deeply parted, its lobes turned downward; stamens exserted; filaments somewhat dilated at the middle, arising from an oblong dilation, the dilation densely short-hairy on its upper margins; sterile filament densely bearded on one side at apex.—Mesas, valley flats and cañons, 1000 to 3000 ft.: coastal S. Cal. from the San Bernardino foothills to San Diego Co.; s. to L. Cal. Apr.-May.

8. **P. lemmònii** Gray. BUSH BEARD-TONGUE. Fig. 854. Bush 2 to 4 ft. high, with vigorous erect glaucous stems from a woody base, rather remotely

leaved; leaves ovate or ovate-lanceolate, acute, sparsely serrulate or entire, light green, glabrous, ½ to 2 in. long; sepals narrowly ovate, acuminate; corolla brownish-buff or purplish and dull yellow, small (½ in. long), with short tube, campanulate-dilated throat and spreading lips; lower lip with 5 longitudinal purple lines running down into throat; sterile filament strongly bearded on one side of the curved apex; capsule 2 lines long.—Along streams in cañons, 800 to 5000 ft.: Coast Ranges from Santa Clara Co. to Siskiyou Co., thence s. in the Sierra Nevada to Placer Co. July-Aug.

9. **P. rothróckii** Gray. Woody at base, forming a bush 10 to 20 in. high and twice as broad; stems of the season and calyces glandular-puberulent; leaves ovate or ovate-oblong, mostly subcordate at base, subentire or undulate-dentate, 3 to 6 lines long, subsessile; flowers sessile in the upper axils of the simple stems, the inflorescence thus spike-like, leafy below; corolla dull yellow or yellowish-white, sometimes purple-tinted outside, sparsely pubescent, 5 to 6 lines long; upper lip arched, notched, about half the length of the tube, the lower lip shorter than the upper, its lobes broadly oblong, recurving; filaments dilated at base, somewhat pubescent at base; sterile filament glabrous, pubescent at base.—Mountain slopes, 6000 to 8000 ft.: s. Sierra Nevada in Tulare, Inyo and Kern Cos.; San Jacinto Mts. (P. scabridus Eastw. P. jacintensis Abrams.)

10. **P. pálmeri** Gray. Stems 1½ to 3 ft. high, woody at base; herbage glabrous, often glaucous, the peduncles, pedicels and calyx sparingly glandular-puberulent; leaves narrowly ovate to lanceolate (or the lowest obovate), sharply or spinulose-dentate, 1½ to 4 in. long, shortly petioled or subsessile; sepals ovate; corolla dull or cream-white, streaked or tinted with violet-purplish or pink markings, 1 to 1¼ in. long, the short tube not longer than the calyx, rather abruptly expanded into the broadly ventricose-campanulate throat; lips short, the upper lip erect, 2-lobed, lower lip widely spreading, hairy on the palate; filaments glabrous or the upper pair obscurely puberulent at base; sterile filament densely yellow-hairy at tip, slightly exserted; style with rusty short hairs below.—Mountain slopes and flats, 2100 to 8000 ft.: mts. of coastal S. Cal.; n. in inner Coast Ranges to San Benito Co.; Mohave Desert; s. Sierra Nevada in Kern and Tulare Cos.; e. to southern Utah. June-July.

11. **P. flóridus** Bdg. Stem simple, 1½ to 3 ft. high; herbage glabrous, somewhat glaucous; leaves oblong to ovate or lanceolate, 1½ to 3 in. long; panicle virgate, the pedicels and calyx glandular-pubescent; corolla pink or pink-red, 11 to 12 lines long, its tube 3 to 4 lines long, the throat abruptly and strongly ventricose on the lower side, the upper side of the corolla nearly straight, the mouth a little constricted; upper lip erect or slightly bent backward, deeply cleft; lower lip deeply cleft, its lobes subequal, deflexed-curving; all the lobes very short (1 to 2 lines long) and very obtuse; sterile stamen glabrous.—Mountains bordering the northern Owens Valley in Inyo Co., 6000 to 8000 ft.: e. slope Sierra Nevada; White Mts.

12. **P. ráttanii** Gray. Stems several from the branched root-crown, erect, 1¼ to 1½ ft. high; herbage glabrous, the inflorescence glandular-puberulent; basal leaves ovate, dentate, ½ to 4 or 7 in. long, on petioles ½ to as long; cauline leaves oblong- or more commonly triangular-ovate, subcordately clasping, ½ to 2¼ in. long; flowers loosely glomerate in an open panicle, the glomerules long-peduncled from the axils; corolla slightly oblique, strongly 2-lipped, lavender or pale purple, 9 to 11 lines long, the throat campanulate-dilated above the narrow tube; lower lip hairy on the palate; sterile stamen sparsely hairy.—Cañons, 3000 to 4500 ft.: Mendocino Co. to Trinity Co. July. Var. MINOR Gray. Inflorescence spike-like; flowers 6 to 7 lines long; sepals attenuate.—Del Norte Co. Var. KLÈEI Gray. Sepals oblong.—Ben Lomond, Santa Cruz Mts.

13. **P. spectábilis** Thurber. Fig. 855. Stems slender, simple, 3 to 4 ft. high; herbage glabrous even to the calyx and corolla; leaves ovate to oblong, acutely dentate, coriaceous, glaucous, 2 to 3¼ in. long, sessile or the lowest petioled, the upper connate-perfoliate; panicle open and elongated, 6 to 17 in. long; sepals oval, subacute; corolla blue or blue-purple, moderately 2-lipped, the

855. Pentstemon spectabilis Thurber; *a*, portion of leafy stem x ⅛; *b*, infl. x ⅛; *c*, fl. x 1; *d*, anther x 3; *e*, sterile filament x 1.

throat red-purple to lilac, 10 to 15 lines long, the tube narrow, twice as long as the calyx, then abruptly dilated into the campanulate or ventricose throat; corolla-lobes truncatish or roundish, subequal, spreading, 2½ to 3 or 4 lines long; upper lip deeply cleft; sterile stamen glabrous.—Dry hills and valleys, 2000 to 4500 ft.: San Luis Obispo Co. to coastal S. Cal., thence e. to N. Mex. Var. GILMÁNII Jepson n. var. Leaves entire; corolla narrower.—Mt. San Jacinto (M. F. Gilman 744, type).

14. **P. frùticifórmis** Cov. Stems 1 to 3 ft. high, only slightly woody at base; leaves lanceolate to linear, entire, sessile or shortly petioled, 1½ to 2½ (or the lowest to 5½) in. long; herbage glabrous throughout, a little glaucous; panicle open but somewhat narrow; corolla white or pale pink with deeper pink or lavender lobes, the throat ventricose-dilated on the lower side, the upper side of corolla nearly straight above the short (2 lines long) proper tube, the tube shorter than the calyx; lips widely gaping, the lower lip spreading, white-hairy at base; upper lip notched, erect; sterile filament hairy at the dilated tip.—Arid montane slopes, 4000 to 6000 ft.: Panamint Mts.; Argus Mts. May-June. Var. SPICIFÒRMIS Jepson n. var. Flowers in glomerate whorls, the inflorescence thus spike-like, the peduncles and pedicels only 1 to 2 lines long; corolla-lobes erosulate.—Upper Kern River (near Trout Mdws., 6300 ft., Jepson 1045, type). Var. INCÉRTUS M. & J. Leaves 1 to 1½ lines wide; pedicels and calyces glandular-puberulent; proper corolla-tube twice as long as calyx.—Southern Sierra Nevada in Inyo Co. and Kern Co. (P. incertus Bdg.)

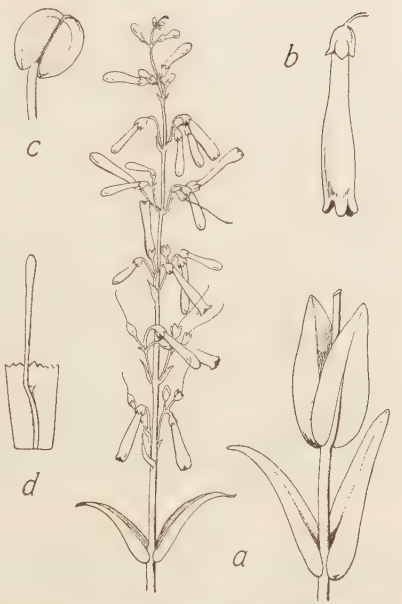
15. **P. clevelándii** Gray. Stems slender, 1 to 2½ ft. high; herbage glabrous throughout or essentially so; leaves fleshy or coriaceous, oblong to ovate, commonly truncatish or subcordate at base, denticulate, 1 to 2½ in. long, the lower petioled, the upper or some of them connate-perfoliate or sometimes distinct; panicle virgate, rather densely flowered, ¾ to 1¼ ft. long; sepals ovate, acute, 1½ to 2 lines long; corolla red, tubular-funnelform, 8 to 9 lines long, the throat narrow but a little distended on the lower side, the lobes subequal, quadratish, spreading or sometimes closely reflexed; sterile filament moderately hairy at the dilated apex, rarely glabrous; capsule ovoid, twice as long as the calyx.—Easterly slopes and cañons, 1000 to 4000 ft.: Santa Rosa Mts. s. to Cuyamaca Mts. and L. Cal. Apr.-May. Var. CONNÀTUS M. & J. Upper leaves connate-perfoliate; sterile filament densely bearded.—Cañons on w. side Colorado Desert. Var. STEPHÉNSII M. & J. Upper leaves connate-perfoliate; sterile filament glabrous.—Providence Mts. (P. stephensii Bdg.)

16. **P. pseŭdospectábilis** Jones. Very near no. 15; stems erect, 3 to 4 ft. high; herbage glabrous and glaucous, the inflorescence sparingly glandular-puberulent; leaves oblong-ovate, sharply dentate, sessile or the lower petioled, or the upper connate-perfoliate, 1½ to 4 in. long; panicle narrow, strict, the glomerules distinct, the bracts very small or foliaceous; corolla pink, tubular-funnelform, 11 to 13 lines long; sterile filament glabrous.—Chuckwalla Mts., e. Colorado Desert; e. to western Ariz.

17. **P. centránthifòlius** Benth. SCARLET BUGLER. Fig. 856. Stems slender, simple, 1 to 4 ft. high, ending in a virgate panicle; herbage glabrous and

glaucous; leaves ovate to elliptic or oblong-lanceolate or lanceolate, entire, sessile or subcordate-clasping; panicle virgate; pedicels very slender, ¼ to ¾ in. long; sepals round-ovate; corolla bright vermilion, tubular, 1 in. long, the lobes nearly equal, turned backward in sets of 2 and 3 and in this way obviously 2-lipped; sterile filament glabrous; capsule 6 to 7 lines long. — Cliffs, sandhills or sandy flats, 600 to 4700 ft.: coastal S. Cal.; n. to San Carlos Range, e. Contra Costa Co. and Vaca Mts.; Mohave Desert; Colorado Desert; e. to Ariz. and southern Utah. Apr.-June. (P. subulatus Jones.)

18. **P. parishii** Gray. Stems slender, virgate, 2 to 3 ft. high, from a woody base; herbage glabrous throughout; leaves ovate to oblong or lanceolate, entire or serrulate, 1½ to 2½ in. long, the upper auriculate-clasping, the lower sessile, the lowest short-petioled; panicle narrow, elongated; sepals ovate, acute; corolla red, tubular-funnelform, glabrous, 10 to 12 lines long, its lobes roundish, 1½ to 2 lines long; anthers slit from end to end, not denticulate; sterile filament glabrous.—Plains, flats and valleys, 1000 to 3000 ft.: s. side San Gabriel and San Bernardino mountains to e. San Diego Co. Apr.-May.



856. Pentstemon centranthifolius Benth.; *a*, portion of leafy stem and infl. x ¼; *b*, fl. x 1; *c*, anther x 3; *d*, sterile filament x 1½.

19. **P. èatonii** Gray. Stem simple, 1 to 2 ft. high; herbage glabrous throughout; leaves ovate to linear-lanceolate, sessile or clasping, 1½ to 4 in. long, the lower ovate to narrowly obovate or broadly oblong, 1 to 2 in. long, on petioles ½ to as long; panicle virgate; corolla vermilion, tubular, obscurely 2-lipped, 1 to 1⅛ in. long, its subequal lobes broad and rounded, 1½ to 2 lines long; fertile filaments glabrous, the upper ones dilated at base; sterile filament with a tuft of bristles at apex; anthers scrobiculate, cleft from the base ¾ of the way to the apex, the margin denticulate.—Mountain slopes bordering or in the deserts, 4000 to 6000 ft.: n. side Colorado Desert; Mohave Desert; e. to southern Nev. and Utah. May-June.

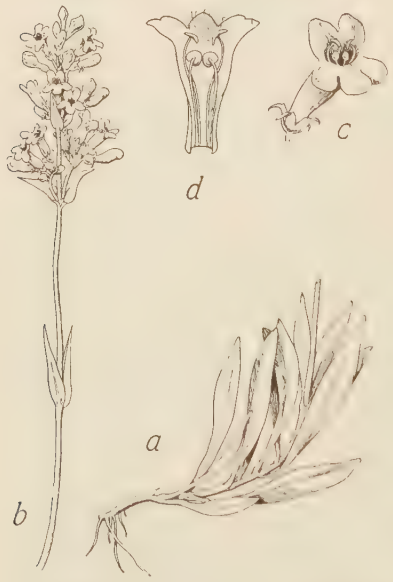
P. MÚNZII Jtn. Corolla red, funnelform-tubular, its lower lip reflexed; sterile filament glabrous (ex char.).—Providence Mts.

20. **P. labròsus** Hook. Stems simple, slender, erect, 1¼ to 2½ ft. high, ending above in a virgate panicle; herbage glabrous throughout; leaves mostly basal or sub-basal, narrowly linear to oblanceolate, glaucous, entire, 2 to 4½ in. long, gradually narrowed at base (especially the lower) to a broad petiole; sepals ovate, acute, the margin denticulate, flowers spreading or horizontal; corolla crimson, tubular, little enlarged upward, 1 to 1⅝ in. long, its equal lips ½ or over ½ the length of the tube; upper lip erect, cleft about ¼ its length; lobes of lower lip widely spreading, linear, 5 to 6½ lines long; sterile filament glabrous.—In chaparral and forest, the leafy bases matting the ground in opens, 4000 to 6000 ft.: Mt. Pinos and Ojai Valley s. through the San Bernardino, San Gabriel, and San Jacinto mountains to L. Cal.

21. **P. glàber** Pursh. Stems several from a vertical rootstock, erect, 1½ to 2 ft. high, the leaves chiefly basal; herbage, pedicels and calyces glabrous, rarely minutely puberulent; leaves narrow-oblanceolate, drawn down to a long petiole-like base, 2 to 4 in. long, the upper ones oblong to linear, sessile;

glomerules sessile or shortly peduncled along the main axis, the inflorescence thus spike-like; sepals ovate, scarious-margined, acuminate; corolla bright blue or purple, 1 to 1¼ in. long, the throat funnelform, enlarged above the tube; anthers dehiscent not quite to apex; sterile stamen densely hispid at apex or glabrous.—Mountain slopes and flats bordering the deserts, 2800 to 8500 ft.: n. slope San Bernardino and San Gabriel mountains; Mt. Pinos; Tehachapi Mts.; White Mts.; Sierra Nevada from Tulare Co. to Sierra Co. and n. to Siskiyou and Modoc Cos.; e. to Nev. and Wyo., n. to Ore. May-July. Var. UTAHÉNSIS Wats. Herbage pruinose-puberulent, as also the pedicels and calyces.—E. slopes or summits of Sierra Nevada in Nevada and Eldorado Cos.; e. to Utah.

22. **P. confértus** Dougl. Stems from a root-crown: herbage glabrous; leaves entire; flowers glomerate, the glomerules forming whorls; calyx-lobes denticulate or lacerate at apex; corolla yellow, the lower lip with a densely hairy patch in center; sterile filament densely yellow-hairy at apex.—Wash. and Ore. Represented with us only by the following varieties: Var. PROCÈRUS Cov. Stems few from the branching root-crown, 1¼ to 1¾ ft. high, the leaves basal and cauline, the cauline leaves only moderately reduced upwards, their blades longer than those of the basal leaves; inflorescence glabrous (in ours) or glandular-pubescent; basal leaves oblong or obovate, mostly acute at both ends, 1 to 2 in. long, gradually narrowed to a petiole ½ to ⅔ as long or sometimes subsessile; cauline leaves oblong to oblong-lanceolate or lanceolate, sessile by an acute or broad base, 1 to 3 in. long; glomerules forming 3 to 5 distinct and often remote whorls, the whorls thus interrupted-spicate; calyx-lobes denticulate or lacerate at apex; corolla blue, tubular, slightly 2-lipped, 6 to 8 lines long, the lips about 1 line long.—Mountain slopes, 5000 to 8000 ft., uncommon in Cal: Sierra Nevada from Fresno Co. to Nevada Co.; n. to Wash. (P. procerus Dougl.). It passes by intergrades into the var. caeruleo-purpureus. Var. RÍGIDUS Jepson n. var. Stems several from the branched crown of a stout vertical root, erect, rigid, 10 to 13 in. high; whorls of inflorescence condensed, capitate-oblong, ¾ to 1 in. long.—E. side Sierra Nevada in Eldorado Co. (Brockway, Lake Tahoe, Jepson 7742, type). Var. CAERÙLEO-PURPÙREUS Gray. Fig. 857. Stems several or many in tufts from a horizontal rootstock, 6 to 15 in. high, the foliaceous bases often forming a loose leafy mat; pedicels and calyx glabrous or sometimes minutely glandular-puberulent; basal leaves narrowly obovate, ⅛ to 1¼ in. long, on petioles ½ as long; cauline leaves linear to linear-oblong or oblong-lanceolate, 1¾ in. long; flowers in 2 to 4 distinct and often remote whorls; corolla 4 to 6 lines long, blue-purple to pale blue, the tube red-purple.—High montane slopes and ridges, 7000 to 10,000 ft.; common: White Mts.; Sierra Nevada from Tulare Co. to Modoc Co.; Yollo Bolly Mts. to Siskiyou Co.; n. to Wash. (P. heterodoxus Gray.) Var. GENICULÀTUS Jepson n. comb. Much condensed, 1½ to 2 (or 4) in. high, the inflorescence reduced to 1 (or 2) whorls.—Alpine in the Sierra Nevada, 9000 to 12,100 ft., from Tulare Co. to Mariposa Co. (P. geniculatus Greene.) Var. MODÉSTUS Jepson n. comb. Stems 6 to 8 in. high; inflorescence usually dense (the whorls congested), ¾ to 1¼ in. long; corolla



857. Pentstemon confertus var. caeruleo-purpureus Gray; *a*, base of plant x ½; *b*, fl. stem x ½; *c*, fl. x 1½; *d*, lower lip spread open and 4 stamens x 1½.

very small (3½ lines long).—East side Sierra Nevada in Lassen Co.; e. to Nev. (P. modestus Greene.)

23. **P. acuminàtus** Dougl. Stems few from the branched root-crown, 9 to 18 in. high, leafy below the inflorescence to the base; herbage, pedicels and calyces glabrous and glaucous; cauline leaves lanceolate to oblong-lanceolate or ovate, commonly with rounded or subcordate sessile base, 1 to 3 in. long, the lower or basal linear or oblanceolate, commonly very much narrower, more or less petioled; flowers in whorled glomerules, the axis with 5 to 7 distinct and mostly approximate but loose whorls; bracts subcordate, mostly broader than long; corolla lilac or blue, tubular-funnelform, very moderately 2-lipped, 7 to 8 lines long; sterile filament dilated and densely yellow-hairy.—Plains and valleys, 4000 to 6000 ft.: rare, Inyo Co.; n. to eastern Ore. and Wash.

24. **P. divérgens** Jones. Stems few or several from a thick heavy root-stock, 7 to 10 in. high; herbage densely or minutely cinereous, the inflorescence densely viscid-villous; leaves oblong-ovate to elliptic, entire, coriaceous, 1 to 3 in. long, the cauline sessile or nearly so, the uppermost ovate-lanceolate, the lower ones on petioles ½ to 1 in. long; flowers in dense whorl-like barely discrete glomerules, the inflorescence thus spike-like and only a little interrupted, 3 to 6 in. long; sepals narrowly lanceolate-attenuate; corolla red, narrow-campanulate above the short tube, 6 to 8 lines long; sterile filament densely yellow-hairy.—Desert ranges, 5000 to 6000 ft., Inyo Co.: Coldwater Cañon, White Mts.; Bishop; Hunter Ranch Mts.; Darwin. (P. monensis Hel.)

25. **P. calcàreus** Bdg. Stems tufted on a woody root-crown, 1½ to 3 in. high; herbage densely puberulent, becoming purplish in age; pedicels and calyces glandular-villous; leaves ovate to elliptic or lanceolate or oblanceolate, entire or with a few remote minute teeth, ¾ to 1¼ in. long, the petioles ½ to as long; flowers in a small panicle, the panicle dense, viscid-villous, ½ to ¾ in. long; sepals narrowly lanceolate-attenuate; corolla pink, nearly tubular, 4 to 6 lines long; sterile filament hairy.—Providence Mts., e. Mohave Desert.

26. **P. albomárginàtus** Jones. Stems several from the root-crown, erect, 5 to 9 in. high; herbage glabrous, shining; leaves obovate to oblanceolate, entire, white-margined, drawn down to a short petiole-like base, ¾ to 1½ in. long; panicle spike-like, leafy, the whorls distinct; sepals lanceolate, narrowly white-margined; corolla pink, tubular-funnelform, 5 to 7 lines long, its palate densely yellow-bearded; sterile stamen glabrous.—Deserts, rare: e. Mohave Desert (Lavic); e. to southern Nev.

27. **P. ambíguus** Torr. var. **thúrberi** Gray. Stems erect, branching, 2 to 5 ft. high, woody at base; herbage glabrous; pedicels and calyx glabrous; leaves very narrowly linear, entire, sessile, ½ to 1¼ in. long; panicle narrow; sepals with narrow scarious margins, ¾ to 1 line long; corolla rose-color or pink, tubular-funnelform, 5 lines long, with ample limb; sterile stamen glabrous.—W. edge of Colorado Desert in San Diego Co. (San Felipe); Ariz. to N. Mex.

28. **P. linàrioìdes** Gray var. **califórnicus** M. & J. Stems several from the branched root-crown, ascending, 4 to 9 in. high; herbage silvery-canescent; leaves oblanceolate, mucronulate, 3 to 5 lines long, drawn down to a short petiole; corolla purple or lilac, 6 to 7 lines long; sterile filament bearded.—Dry rocky hillsides, 4000 to 5000 ft., rare: San Jacinto Mts.

29. **P. deústus** Dougl. Stems several to many from the branched root-crown, simple, erect, 5 to 12 in. high; herbage and inflorescence glabrous, the pedicels and calyces scantily and minutely puberulent or sometimes a little glandular; leaves ovate to linear-oblong or oblong-lanceolate, sharply serrate, ½ to 1¼ in. long, sessile or the lower drawn down to a very short petiole; flowers glomerate in the opposite axils and thus whorl-like, the whorls discrete, forming a spike-like panicle 3 to 7 in. long, bracteate above, leafy at base; corolla blue, 4 to 5 lines long; filaments rather markedly dilated; sterile stamen glabrous; anthers glabrous, the margins not ciliate.—High montane, 4500 to 7000 ft., n. Cal.: Nevada Co. to Tehama and Modoc Cos., thence w. to

Siskiyou and n. Humboldt Cos.; n. to Ore. June-July. Var. ARENÀRIUS Jepson n. comb. Herbage pilose, rarely glabrous, the pedicels and calyx viscid-pilose; sterile filament glabrous or a little hairy.—Lassen Co.; also Esmeralda Co., Nev. (P. arenarius Greene. P. sudans Jones.)

30. **P. ovâtus** Dougl. Flowering stems 1 to 2¼ ft. high, somewhat leafy, arising from a basal cluster of short leafy shoots; herbage glabrous, the inflorescence glandular-puberulent; basal leaves oblong-ovate to lanceolate-ovate, denticulate, 1½ to 2¾ in. long, on petioles ½ to ¾ as long; cauline leaves 2 or 3 pairs, remote, ovate or ovate-lanceolate, mostly subcordate at the sessile base, 1 to 3 in. long; flowers in dense whorls, the whorls discrete or sometimes remote; corolla purple-blue, 6 to 7 lines long, its lobes short, obtuse or subacute, the upper and lower lips equal or nearly so; lower lip with a few sparse hairs; fertile filaments glabrous, the sterile much longer than the fertile, glabrous or plainly hairy but the hairs discrete.—Montane slopes, 6000 to 7000 ft.: Yollo Bolly Mts. and n. Humboldt Co. to Siskiyou Co.; n. to Wash.

31. **P. gracilèntus** Gray. Stems slender, erect from a woody base, 10 to 18 in. high, leafy at base or on lower portion, the upper portion of the stem with reduced leaves or nearly naked; herbage glabrous, the pedicels and rachis minutely glandular-puberulent; leaves linear-oblanceolate or oblanceolate-oblong, or linear-oblong to linear, entire, 1½ to 2½ in. long, narrowed below to petiole ¼ to ½ as long; flower-clusters remote, forming a narrow thyrsus or loose panicle; corolla blue, 6 to 8 lines long, tubular, but enlarged upward a little, 2-lipped, the lips short (1¼ to 2 lines long); upper lip notched, the lower lip parted into 3 oblong lobes; sterile filament yellowish-hairy on one side above the middle, as long as the stamens; anthers deeply sagittate, cleft only at apex, glabrous.—Open forest slopes, 7000 to 7500 ft.: n. Sierra Nevada from Nevada Co. to Siskiyou and Modoc Cos.; nw. Nev. to s. Ore. July-Aug. Var. URSÒRUM Jepson n. var. Leaves glaucous; corolla-throat more dilated (3 lines broad).—Bear Valley, Nevada Co., 4500 ft. (Jepson, type).

858. Pentstemon laetus Gray; *a*, fl. branchlet x ½; *b*, lower lip x 1; *c*, anther x 4.

32. **P. laètus** Gray. Fig. 858. Stems of the season erect or ascending, 4 to 14 in. high, borne on an abbreviated woody base; herbage cinerulous or minutely puberulent, the pedicels and calyces minutely and rather sparingly glandular-puberulent; leaves oblanceolate to linear or lanceolate, entire, sessile, ½ to 3 in. long; panicle racemose, loose; sepals linear or lanceolate to narrowly ovate; corolla funnelform, 9 to 16 lines long, blue to bluish-purple with 2 oblong white patches on throat below sinuses of lower lip; lobes of lower lip oblong, 1½ lines long, those of the upper round-ovate; sterile filament glabrous; anthers commonly hairy at point of insertion on the filament.—Open dry slopes or flats, 3200 to 8000 ft.: n. Ventura Co.; Sierra Nevada from Kern Co. to Siskiyou Co., thence s. to Humboldt Co.; w. Nev. to s. Ore. June-July. (P. cinerascens Greene.) Var. LEPTOSÉPALUS Greene. Leaves glabrous; sepals linear-attenuate, 4 to 5 lines long.—Lassen Peak. Var. RÒEZLII Jepson n. comb. Sepals acuminate; corolla 6 to 7 lines long.—Montane, 5000 to 6500 ft., Placer Co. to Trinity Co. (P. roezlii Regel.)

33. **P. caèsius** Gray. Stems erect from a branched woody base, 12 to 15 in. high, the leaves mostly basal or sub-basal; herbage glabrous and glaucous,

the pedicels and calyx glandular-puberulent; leaves ovate or orbicular, coriaceous, 4 to 12 lines long, the petioles half to as long; upper leaves oblanceolate; panicle open, rather broad, 4 to 10 in. high; corolla tubular, blue, 10 to 11 lines long; sterile stamen glabrous.—Rocky montane flats or rocky slopes, 6500 to 9800 ft.: San Gabriel Mts.; San Bernardino Mts.; s. Sierra Nevada in Tulare Co.

34. **P. purpùsii** Bdg. Stems diffuse or ascending from a woody base, 4 to 6 in. high; herbage, especially the leaves, densely white-canescent; leaves oval or roundish-ovate, very obtuse, 2 to 3 lines long, abruptly drawn down to a petiole ½ as long; upper leaves obovate or oblanceolate, scarcely petioled, 4 to 5 lines long; inflorescence spike-like, 1 to 3 in. long, glandular-pubescent; sepals linear; corolla violet, tubular-funnelform, 1 to 1⅛ in. long; sterile filament glabrous; anthers hairy in the sinus.—Yolly Bolly Mts. to high mts. of n. Lake Co. (Mt. Sanhedrin, Snow Mt.). July.

35. **P. jaffrayànus** Hook. Stems several, erect from a woody base, 9 to 14 in. high; herbage glabrous and blue-glaucous; lower leaves obovate or spatulate, gradually drawn down to a narrow or petiole-like base, 1 to 1½ in. long; middle cauline leaves commonly elliptic, broadly ovate or rarely ovate-lanceolate, ½ to 1 (or 1¾) in. long, sessile, sometimes a little subcordate at base; flowers in a narrow panicle, the lower clusters on peduncles commonly 6 to 9 lines long; corolla lilac or purplish-blue, ¾ to 1½ in. long, the throat campanulate; sterile stamen glabrous.—Rocky ridges or slopes, 5000 to 7000 ft.: Sierra Nevada from Tulare Co. to Butte and Shasta Cos.; inner North Coast Ranges from Lake Co. to Siskiyou Co. July-Aug. Var. PÁRVULUS Jepson n. comb. Leaves 6 to 8 lines long; corolla 6 to 7 lines long.—High montane: Tulare Co.; Siskiyou Co. (P. azureus var. parvulus Gray.)

36. **P. héterophýllus** Lindl. Fig. 859. Stems erect or ascending, many from the base, often reddish, ¾ to 2 ft. high; herbage, pedicels and calyx minutely puberulent, sometimes glabrous and green; leaves narrowly linear to lanceolate or oblanceolate, 1 to 3 in. long, mostly ¼ to 2 lines wide; flowers spreading or horizontal, solitary in the axils of the opposite bracts and thus forming a strict or spike-like panicle, the lower clusters on peduncles commonly 2 to 6 lines long; sepals ovate, acuminate; corolla blue or purple, rather abruptly ventricose-dilated above the narrowly tubular base, ⅞ to 1⅜ in. long; upper lip short, more or less reflexed, the lower longer, spreading; sterile filament glabrous. — Open places, rocky hillslopes, flats in the hills or mountain valleys or in beds of winter streams, 200 to 5500 ft.: Sierra Nevada foothills from Amador Co. to Mariposa Co.; Coast Ranges from Mendocino and w. Colusa Cos. to San Luis Obispo Co.; s. to Ventura and San Diego Cos. May-June. Var. AZÙREUS Jepson n. comb. Herbage cinereous-puberulent, often glaucous; leaves mostly 1 to 3½ lines wide.—Sierra Nevada foothills and middle altitudes, Mariposa Co. to Butte Co. (P. azureus Benth.)

37. **P. bridgesii** Gray. Flowering stems simple, 1 to 2¼ ft. high, arising from short woody bases; leaves linear or narrow-oblanceolate to oblong, acute or obtuse, 1 to 3 in. long, narrowed below to a short petiole; lowest leaves spatulate-obovate,

859. Pentstemon heterophyllus Lindl.; *a*, sect. of stem with leaves x ½; *b*, infl. x ½; *c*, anther x 4½.

rather short; herbage glabrous, the pedicels and calyx glandular-puberulent; panicle narrow or virgate, more or less secund; corolla red or scarlet, 1 to 1¼ in. long, tubular-funnelform, markedly 2-lipped, the lips ⅓ to ⅔ as long as the tubular portion; upper lip erect, notched; lower lip spreading or recurving, with 3 broadly linear or oblong lobes; sterile filament glabrous.—Talus or rock outcrops, 4500 to 8500 ft.: high coastal mts. of S. Cal. and n. to northern Ventura Co.; Tehachapi Mts.; Sierra Nevada from Kern Co. to Tuolumne Co.; White Mts.; e. to Col. and Ariz. June.

9. **CHELÒNE** L.

Perennial herbs. Leaves opposite, acutely serrate. Flowers large. Anthers long-woolly. Sterile filament conspicuous. Seeds surrounded by a broad membranous wing. (Greek chelone, tortoise, the corolla resembling the head of that pedestrian.)

1. **C. nemoròsa** Dougl. Stems simple, 1½ to 2 ft. high; herbage glabrous up to the inflorescence, this more or less glandular-pubescent; leaves ovate to lanceolate, 1½ to 2 in. long, petiolate; flowers pediceled in an open 3 to 12-flowered panicle with lanceolate bracts; calyx 5 lines long, the sepals lanceolate, about equal; corolla violet-purple, 1 in. long, with widely open orifice; upper lip short, 2-cleft, the lower spreading, 3-cleft; sterile filament hirsute at apex, the fertile filaments glabrous or pubescent above, hirsute at base.—Along wooded mountain streams: Marble Mt., Siskiyou Co.; n. to Wash.

10. **DÍPLACUS** Nutt.

Evergreen glutinous shrubs with branching pubescence, one species an herb with mainly simple hirsute-glandular pubescence. Leaves opposite, revolute in the bud. Flowers red or yellow, solitary in the axils. Calyx tubular, 5-angled, 5-toothed. Corolla with funnelform tube and rather broad 2-lipped limb. Stamens 4. Stigma of two flat lobes, closing together when irritated. Capsule firm-coriaceous, ovatish-oblong to linear-oblong, included in the calyx, with a woody enlargement at the pointed apex, opening down the upper suture only or mainly, the valves spreading out nearly flat and bearing the placentae on their middle. (Greek, di, double, and plakous, a cake, referring to the placentae.)

Herb; pubescence hirsute-glandular with mainly simple hairs; corolla golden-yellow..... 1. *D. clevelandii.*

Shrubs; more or less glutinous, the pubescence almost none to dense, of mainly branched hairs.

Corolla cream-color to salmon-color.

Corolla-throat broad, somewhat gibbous, abruptly narrowed to slender tube..... 2. *D. longiflorus.*

Corolla-throat narrow-funnelform, gradually narrowed to tube.

Pedicels rather fleshy, about ¼ in. long; calyx-teeth spreading..3. *D. aridus.*

Pedicels slender, about ½ in. long; calyx-teeth mainly erect..... 4. *D. aurantiacus.*

Corolla red or shaded with red.

Leaves linear-lanceolate .....5. *D. puniceus.*

Leaves ovate or rhombic-ovate.....6. *D. parviflorus.*

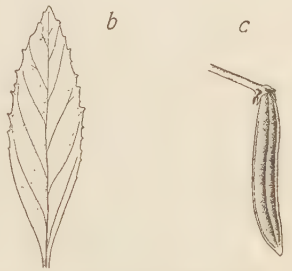
1. **D. clevelándii** (Bdg.) Greene. Stems several, erect, simple, herbaceous, 1 to 2 ft. high from a woody base; herbage yellowish-green, glandular-hirsute with mainly simple hairs; leaves oblong to lanceolate, acute, more or less serrate along upper half, sessile, ¾ to 3 in. long; pedicels slender, scarcely 2 lines long; calyx narrow-campanulate, constricted just above the ovary, 10 to 11 lines long, increasing a little in fruit, the lanceolate lobes becoming somewhat foliaceous; corolla golden-yellow, 1½ in. long, the tube included, narrow at base, expanding gradually into a long open throat, the lobes rounded, entire, nearly equal; capsule 5 to 6 lines long, ovatish-oblong.—High ridges, 4000 to 6000 ft., w. Riverside Co. and San Diego Co. May-July.

2. **D. longiflòrus** Nutt. Much branched shrub 1 to 3 ft. high; leaves lanceolate to linear-lanceolate or -oblong, plane to revolute, entire or more or less evidently toothed, pubescent beneath, 1 to 3 in. long, with smaller leaves frequently fascicled in the axils; younger branches, pedicels, and calyces

villous with branched hairs; calyx with expanding throat, its teeth narrow, obtuse; corolla salmon yellow, 1¾ to 2¾ in. long, the throat broad, somewhat gibbous at base, funnelform, the tube slender; capsule oblong, somewhat acuminate, 8 to 10 lines long.—Foothills, 500 to 5000 ft.: San Luis Obispo Co. to cismontane S. Cal.; s. to L. Cal. Var. CALÝCINUS Jepson n. comb. Leaves commonly broader, obovate to oblong, obtuse; herbage with more conspicuous pubescence, the hairs longer, very fine and somewhat matted; calyx-teeth broader, somewhat foliaceous.—Foothills, 1000 to 2500 (or 6000) ft.: Fresno Co. to Tehachapi Mts. Apr.-July. (D. calycinus Eastw.) Var. GRANDIFLÒRUS Jepson n. comb. Lower than the species, the branches ascending, 8 to 10 in. or rarely 2 ft. high; branches and pedicels puberulent with some glandular hairs, and with few long simple hairs, the latter more abundant at the upper nodes; leaves oblong to obovate, obtuse, slightly toothed or entire, somewhat revolute, essentially glabrous, more or less coated with a glossy resin, the larger 1 to 2 in. long, 5 to 8 lines wide; corolla very pale salmon-color to pale cream-color.—Foothills, 2000 to 3500 ft.: Plumas Co. to Nevada Co. June-July. (D. grandiflorus Groenl.)

3. **D. áridus** Abrams. Decumbent, the short leafy branches 6 to 9 in. high, resinous-glandular, the cortex yellow; leaves oblanceolate to oblong, ½ to 1½ in. long, remotely toothed, revolute-margined; pedicels slightly fleshy, glabrous, about 3 lines long; calyx tubular below, constricted at throat, the plicate teeth abruptly spreading; corolla pale buff to yellow, 1¾ to 2 in. long, the slender tube 1 in. or a little more, exserted, abruptly expanding to a wide throat, the limb short, its lobes rounded, slightly notched.—Dry hills, San Diego Co.: Jacumba; El Cajon.

4. **D. aurantìacus** Jepson n. comb. BUSH MONKEY-FLOWER. Fig. 860. Low shrub 2 to 4 ft. high; leaves oblong-lanceolate, 1½ to 5 lines wide, revolute, denticulate, deep green and nearly glabrous above, pubescent beneath with branching hairs; pedicels slender, commonly glandular-puberulent, about ½ in. long; calyx tubular, the plicate throat spreading but little, the orifice margined with branching hairs; corolla buff or salmon-color, 1½ to 1¾ in. long, the throat narrow-funnelform, the lower lip shorter than upper, the lobes emarginate, with more or less irregular margin; capsule linear-oblong, 5 to 9 lines long.—Dry hills and cañon sides, 20 to 1500 ft.: Ventura Co. to Del Norte Co.; Sierra Nevada foothills from Tuolumne Co. to Placer Co. Apr.-Sept. (Mimulus aurantiacus Curtis. Diplacus glutinosus Nutt.)



860. Diplacus aurantiacus Jepson; *a*, sect. of fl. branchlet x ¾; *b*, leaf x 1; *c*, capsule x 1¼.

5. **D. puníceus** Nutt. Shrub 1½ to 5 ft. high; leaves linear-lanceolate, obtuse, firm, with revolute margins; calyx narrow-cylindric, the teeth not spreading; corolla brick-red, varying to yellow faintly shaded with red, 1½ to 2 in. long, the lobes quadrate, notched or toothed; capsule cylindric, obtuse, nearly as long as calyx.—Dry hillsides, Ventura Co. to San Diego Co.; s. to L. Cal. Some forms approach D. aurantiacus, others D. longiflorus.

6. **D. parviflòrus** Greene. Rigidly shrubby, ¼ to 2 ft. high; leaves narrowly ovate or rhombic-ovate, the larger 6 to 11 lines wide, serrate; calyx tubular, the lobes somewhat spreading, especially the upper; corolla brick-red, nearly tubular, 1 to 1½ in. long, the small entire quadrate lobes but little spreading; stamens exserted.—Santa Cruz and Santa Rosa islands. Jan.-Aug.

11. MÍMULUS L. Monkey-flower

Herbs with opposite leaves. Herbage glabrous or with simple hairs. Flowers mostly showy, yellow or red, solitary and axillary, or in terminal racemes. Calyx prismatic, 5-angled, 5-toothed. Corolla tubular to funnelform, strongly 2-lipped or with slightly unequal lobes, a pair of bearded or naked ridges running down the lower side of the throat. Stamens 4. Stigma mostly of 2 flat lobes closing together when irritated. Capsule dehiscent by both sutures, dehiscent on one side only, or cartilaginous and indehiscent. Seeds many. (Diminutive of the Latin mimus, a comic actor, on account of the gaping or grinning corolla.)

A. Pedicels inconspicuous, 1 line long or less.

1. Calyx-lobes connivent over capsule in fruit; capsule cartilaginous.

Plants glabrous or nearly so; corolla very large for the size of the plant; capsule ovate to oblong-obtuse.
- Corolla with well developed lower lip; calyx-lobes foliaceous.
  - Corolla-tube ending in short throat and limb spreading abruptly; capsule short-ovate, not flattened ..... 1. *M. angustatus.*
  - Corolla-tube expanding into long open-funnelform throat and limb spreading gradually; capsule oblong, obtuse at apex, flattened ..... 2. *M. tricolor.*
- Corolla with lower lip almost none; calyx-lobes short in flower, thickened, continuing from prominent calyx-ribs ..... 3. *M. douglasii.*

Plants usually viscid-puberulent; corolla of moderate size for size of plant, with lower lip ½ as long as upper.
- Capsule arcuate-gibbous ..... 4. *M. latifolius.*
- Capsule oblong-linear ..... 5. *M. kelloggii.*

2. Calyx-lobes not connivent over capsule in fruit.

Inflorescence with leaves or bracts not exceeding flowers.
- Calyx increasing conspicuously in fruit.
  - Calyx-teeth at first oblong-linear, ¼ to ⅓ the length of calyx-tube, widening to triangular as ovules develop and calyx-tube increases.
    - Corolla-tube and throat thrice the length of calyx; herbage scentless; corolla commonly crimson ..... 6. *M. nanus.*
    - Corolla-tube and throat about twice the length of calyx; herbage strong-scented; corolla yellow ..... 7. *M. mephiticus.*
  - Calyx-teeth triangular acute to accuminate from opening of bud; corolla-limb red or pink.
    - Branches slender.
      - Calyx-teeth acuminate; capsule long-pointed, exserted .... 8. *M. layneae.*
      - Calyx-teeth triangular; capsule obtuse or abruptly pointed, more or less exserted ..... 9. *M. torreyi.*
    - Stems, and branches (if any) stout; calyx-teeth unequal.
      - Capsule exceeding calyx-teeth; corolla-tube slender ..... 10. *M. bigelovii.*
      - Capsule not exceeding calyx-teeth; corolla-tube rather wide ..... 11. *M. bolanderi.*
- Calyx increasing but little in fruit.
  - Corolla-limb not white-mottled or bordered; calyx not gibbous.
    - Inflorescence not subsecund.
      - Capsule much exserted ..... 12. *M. rattanii.*
      - Capsule usually shorter than calyx-teeth ..... 13. *M. fremontii.*
    - Inflorescence subsecund; capsule about equaling calyx-teeth. 14. *M. subsecundus.*
  - Corolla-limb white-mottled or bordered; calyx gibbous.
    - Stem not dense with flowers and fruit ..... 15. *M. pictus.*
    - Stem dense with flowers and fruit ..... 16. *M. mohavensis.*

Inflorescence with leaves greatly exceeding the flowers; corolla 3 to 4 lines long; calyx-teeth triangular ..... 17. *M. leptaleus.*

B. Pedicels conspicuous, more than 2 lines long.

1. Corolla regular to slightly 2-lipped.

Capsule not splitting at apex.
- Herbage with evident pubescence.
  - Perennial from creeping rootstock ..... 18. *M. moschatus.*
  - Annuals.
    - Stems flexuous or slender; fruiting calyx chartaceous.
      - Calyx more or less villous; stems very leafy ..... 19. *M. floribundus.*
      - Calyx glabrous to minutely hispid; cauline leaves few and smaller ..... 20. *M. arenarius.*
    - Stems rigid, usually 6 to 10 in. high; fruiting calyx dense.
      - Corolla yellow and white or orange ..... 21. *M. bicolor.*
      - Corolla reddish purple ..... 22. *M. bioletti.*
- Herbage apparently glabrous; annuals, 2 to 6 in. high.
  - Calyx-teeth equal ..... 23. *M. pulsiferae.*
  - Calyx-teeth unequal ..... 24. *M. latidens.*

Capsule with supra-placental tissue splitting at apex.
Annuals.
Herbage viscid-pubescent to apparently glabrous.
Calyx-teeth unequal; cauline leaves ovate.....25. *M. inconspicuus.*
Calyx-teeth equal; cauline leaves linear or oblong to lanceolate.
Corolla 2 to 3 lines long.....26. *M. rubellus.*
Corolla 6 to 10 lines long.
Corolla crimson to purple.....27. *M. palmeri.*
Corolla yellow, red-dotted or partly crimson....28. *M. montioides.*
Herbage slimy-villous; corolla pale pink, only the limb exserted..29. *M. parishii.*
Perennial with pubescent stolons and glabrous rootstocks; pedicels scape-like; corolla yellow .....30. *M. primuloides.*

2. Corolla strongly 2-lipped.

Herbage minutely pubescent or apparently glabrous.
Leaves palmately veined.
Plants with distinctly basal leaves as well as cauline leaves.
Corolla 2 to 8 lines long.
Leaves rhombic-orbicular, shallowly erose-dentate, all petioled.....
31. *M. alsinoides.*
Leaves lyrate to deeply laciniate or pinnatifid, all, except the highest floral, petioled .....32. *M. laciniatus.*
Corolla 9 to 15 lines long; leaves orbicular to oblanceolate, the upper sessile or short-petioled, the basal petioled, often with ragged lobes at base. .....33. *M. guttatus*
Plants with cauline leaves only; leaves never lobed at base; stems from coralloid rootstocks.
Leaves thin, not slimy; calyx campanulate.....34. *M. tilingii.*
Leaves thickened, clammy or slimy; calyx broad-campanulate, purple-dotted.
35. *M. implexus.*
Leaves pinnately veined; stems 10 to 12 in. high from slender rootstocks.....
36. *M. dentatus.*
Herbage markedly viscid-pubescent; stems erect, commonly 1 to 2 ft. high.
Corolla yellow; leaves lanceolate; capsule stout-walled, coriaceous....37. *M. brevipes.*
Corolla scarlet or pink; capsule chartaceous.
Corolla scarlet; leaves ovate to obovate-lanceolate.....38. *M. cardinalis.*
Corolla rose-pink; leaves lanceolate to oblong.....39. *M. lewisii.*

1. **M. angustàtus** Gray. Leaves and flowers in a basal tuft (the tuft sessile on the root-crown); herbage glabrous; leaves linear, ⅓ to 1 in. long; calyx 3 to 4 lines long, the teeth very little unequal, green-foliaceous, oblong, acute; corolla crimson, purple and yellow-dotted, the filiform tube 1 to 1½ in. long, 4 to 6 times the length of the short-funnelform throat; limb broad, the upper lip exceeding the lower; capsule short-ovate, not flattened, almost as long as thick; seeds favose-pitted.—Gravelly stream borders, 1500 to 3500 ft.: Napa Co. to Mendocino Co.; Mariposa Co. to Modoc Co. (Eunanus pulchellus Drew.) M. PYGMAÈUS Grant. Perhaps a reduced form.—Egg Lake, Modoc Co.

2. **M. trìcolor** Hartw. Fig. 861. Dwarf plant, the stem ¼ to ½ in. high erect or the branches 3 to 4 in. long and decumbent; leaves lanceolate to oblanceolate-oblong, entire or remotely toothed, ¾ to 1 in. long; calyx 6 to 8 lines long with green-foliaceous lobes; corolla rose-purple, 1½ to 2 in. long, with little unequal lips and broadly funnelform throat bearing markings of crimson and yellow; capsule oblong, slightly gibbous, compressed.—Edges of vernal pools, plains and valley floors, 50 to 500 ft.: San Benito Co.; e. side San Joaquin Valley, rare; Sacramento Valley, common; Sonoma and Lake Cos.; n. to Ore. Apr.-May.

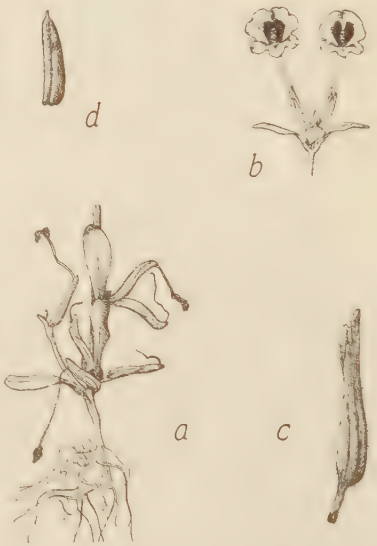
861. Mimulus tricolor Hartw.; habit x 1.

3. **M. douglásii** Gray. Dwarf plant about 1½ in. high, the leaves and flowers in a tuft on the ground or on a very short stem; leaves rhombic-ovate to oblong, 2 to 4 lines long, entire or crenate-toothed; calyx 4 to 5 lines long, membranous and sulcate between the ribs, the ribs thickened and ending in short blunt un-

equal teeth; corolla crimson or red-purple, 1½ in. long, the slender tube twice or thrice the length of the calyx, the throat oblong-urnshaped or campanulate; upper lip conspicuous, erect; lower lip reduced to a narrow 2 or 3-crenate border or consisting of a more prominent tooth-like middle lobe and the lateral lobes obsolete; capsule oblong, acute, 2 to 4 lines long, very gibbous.—Wet hillsides in the foothills, 500 to 2500 ft.: Monterey Co. to Humboldt Co.; Tulare Co. to Butte Co.; n. to Ore. (M. subuniflorus Jepson.)

4. **M. latifòlius** Gray. Stem erect, seldom branched, 1 to 3 in. high; herbage viscid-pubescent; leaves ovate, 2 to 6 lines broad; calyx oblong with oblique throat; corolla reddish-purple, 9 to 15 lines long, the upper lip erect, twice as long as the lower; capsule arcuate-gibbous, pointed, laterally compressed, 3 to 5 lines long, 1 to 2 lines broad at base.—Santa Cruz Isl., S. Cal. coast; Guadalupe Isl., L. Cal.

5. **M. kellóggii** Curran. Fig. 862. Stem erect, simple, 1 to 5 in. high, or occasionally 7 or 8 in., with several branches from the base; herbage viscid-pubescent; leaves broadly ovate to oblong (the lowest elliptic-ovate), mostly attenuate at base to a petiole, ½ to 1 in. long, generally dull purple beneath; calyx narrowly cylindrical (6 lines long and 1 line broad), sometimes strongly gibbous, white-membranous and sulcate between the purplish ribs so as to appear striped, very oblique, the teeth very short and obtuse; corolla-tube very long and slender, twice as long as the calyx, expanding into the short-funnelform throat and broad limb, the lower lip only ½ as long as the upper and more spreading; capsule 4 to 5 lines long, slender, bisulcate, slightly curved outwardly (with the calyx), or sometimes contorted, simulating that of Oenothera micrantha.—Hillslopes, 800 to 3000 ft.: North Coast Ranges; Sierra Nevada foothills from Tulare Co. to Eldorado Co. Apr.



862. Mimulus kelloggii Curran; *a*, base of fruiting plant x 1; *b*, fls. x ¾; *c*, fr. calyx x 1½; d, capsule x 1½.

6. **M. nànus** H. & A. Stem ¾ to 4 in. high, simple or freely branched from below with upper internodes usually reduced so that inflorescence is crowded; herbage viscid-puberulent; leaves obovate to lanceolate, entire, or crenate at apex, ¼ to 1 in. long; flowers usually in pairs; calyx at first about 2 lines long, about ⅓ the length of corolla-tube and throat, increasing as ovary matures, the linear teeth ¼ the length of calyx-tube, widening to triangular; corolla red with yellow markings in throat, 5 to 8 lines long, the throat gradually narrowing to a long slender tube; anthers hispid; stigma broad, crimson, exserted.—Granite sand in the mts., 5000 to 11,000 ft.: Sierra Nevada from Tulare Co. to Nevada Co. and n. to Siskiyou Co.; n. to Wash.

7. **M. mephíticus** Greene. Stem simple, slender, later often densely branched above with crowded inflorescence, 2 to 6 in. high; herbage viscid-puberulent, strongly scented; leaves oblong-lanceolate to linear, commonly entire; calyx at first about two lines long with nearly linear teeth, later as ovary develops, increasing to 3 (or rarely 5) lines long and widening, white-membranous between the green ribs, the teeth becoming triangular; corolla yellow, 5 to 7 lines long, the throat sometimes reddish-dotted; capsule oblong-ovate, 3 to 3½ lines long (in rank individuals longer), exserted.—Montane, 5000 to 11,000 ft., Sierra Nevada from Plumas Co. to Tulare Co. July-Sept.

863. Mimulus torreyi Gray; *a*, habit x ⅔; *b*, pair of stamens x 7.

8. **M. làyneae** Greene. Stem at first simple, later with many spreading branches, 4 to 7 in. high, viscid-pubescent and somewhat nigrescent; leaves narrowly ovate to oblong, acute at base and apex, about 6 or 7 lines long; calyx 4 lines long, its teeth sharply acute, slender, exceeding ½ line; corolla red, tubular-funnelform, 6 to 10 lines long, the tube tapering to a narrow base, 2 to 3 lines long, much exserted; anther-cells minutely hispid; capsule acute, exserted.—Valley or montane flats, 500 to 5000 ft.: Napa Co. to Siskiyou Co.; Fresno Co. to Lassen Co. June-July.

9. **M. tórreyi** Gray. Fig. 863. Stem at first low, simple, single-flowered, 1 to 2 in. high, later becoming evenly branched, many-flowered and 3 to 10 in. high, with rather long internodes; herbage viscid-pubescent; leaves oblanceolate, entire or subdentate, 6 to 9 or 12 lines long; calyx at first less than ⅓ the length of the corolla but increasing in age; corolla pink-purple with a purple-dotted cream-color area between throat-folds, 6 to 8 lines long, the throat funnelform, gradually widening into the limb; capsule coriaceous, more or less exserted at maturity.—Montane, 4500 to 6000 ft., Sierra Nevada from Fresno Co. to Plumas Co. June-Aug.

10. **M. bigelòvii** Gray. Stems 1 to 4 from the base, nearly erect, simple or with a pair or more of ascending branches, 2 to 6 in. high; herbage viscid-pubescent; leaves oblong to lanceolate (sometimes ovate-acuminate); calyx 3 lines long in flower, increasing in fruit, cleft into acute subulate teeth for ⅓ its length, most deeply cleft in front; corolla crimson with yellow purple-dotted throat, ½ to 1 in. long; capsule oblong-lanceolate, exserted.—Arid or desert mountain slopes or flats, 500 to 6000 ft.: w. side Colorado Desert; n. side San Bernardino Mts.; San Gabriel Mts.; Mt. Pinos; Tehachapi Mts.; Mohave Desert; Inyo Co.; e. to southern Utah. Apr.-June. (M. johnstonii Grant, a mature or fruiting form.)

11. **M. bolánderi** Gray. Tobacco Mimulus. Fig. 864. Stem simple or much branched with erect branches, 5 to 16 in. high; herbage glandular-pubescent and very viscid; leaves lanceolate or oblong, sometimes obovate, sparingly denticulate at apex, 1 to 1¾ in. long, sessile; calyx 2 to 3 lines broad, 5 to 6 lines long, strongly plicate-angled, somewhat contracted at the very oblique orifice, its teeth acute, the upper much the longest; corolla dark red or sometimes with the palate dotted red and white, 6 to 9 lines

864. Mimulus bolanderi Gray; *a*, fl. branchlet x ½; *b*, capsule x 1½.

long, the tube not slender, moderately exserted; limb about 4 lines broad, the lips of nearly equal length; capsule not exceeding the calyx-teeth, slender, and narrowed to the pointed apex, about 5 lines long, 1 line broad.—Coast Ranges, 2500 to 4500 ft. from Monterey Co. to Mendocino and Lake Cos. July.

12. **M. rattánii** Gray. Stem erect, branched from the base, 4 to 5 in. high; herbage glandular-viscid with a nigrescent indument; leaves obovate, oblong or oblanceolate, mostly tapering above and below, 6 lines long or less; corolla-tube scarcely exserted from the narrowly campanulate or in age somewhat urnshaped calyx; calyx-teeth little unequal; apex of capsule narrow, somewhat curved, exserted.—Montane, rare: Santa Cruz Mts.; Mt. Diablo; Mt. Tamalpais; Lake Co.; w. Colusa Co.

13. **M. fremóntii** Gray. Stem at first shorter than the flowers, becoming much-branched, rather spreading from the base, 2 to 6 in. high, more leafy than in no. 12; herbage viscid-hispid; leaves oblong, 4 to 9 lines long, or the lowest sometimes longer, entire or toothed near the apex; calyx hardly oblique, not quite ½ as long as corolla, increasing but little in fruit, teeth rather short, triangular; corolla crimson, 7 to 9 lines long, the throat gradually funnelform; capsule usually shorter than calyx-teeth.—Foothills, 1000 to 5300 ft.: South Coast Ranges from Mt. Diablo to the San Carlos Range; s. to the mts. of coastal S. Cal. on both the desert and inner sides from Tehachapi Mts. and n. Ventura Co. to San Diego Co. May. Var. víscidus Jepson n. comb. Corolla with shorter limb, often paler pink, the palate sometimes bearing a white spot.—Sierra Nevada, 2000 to 5500 ft., from Calaveras Co. to Fresno Co. and s. to Tehachapi Mts. (M. viscidus Congdon. M. subsecundus var. constrictus Grant.)

14. **M. subsecúndus** Gray. Stems few to several from the base, 3 to 5 in. high; herbage viscid-pubescent; leaves oblong, the lower less than 1 in. long, the upper shorter than the fruiting calyces; branches of inflorescence elongated with flowers rather subsecund and spicately disposed; calyx somewhat plicate with acute to acuminate teeth, 2½ lines long, becoming 3½ to 4 lines long in fruit; corolla deep red with nearly regular limb, about ½ in. long; capsule cylindric, taper-pointed.—Foothills, 1500 to 2000 ft.: Contra Costa Co. to San Luis Obispo Co.; s. Sierra Nevada in Tulare Co.

15. **M. píctus** (Curran) Gray. Stem nearly erect, lightly wing-angled, 4 to 12 in. high; herbage viscid-pubescent; leaves obovate to oblong, ½ to ¾ in. long; flowers numerous, not densely crowded; calyx rather viscid-villous, oblong, gibbous, the teeth obtuse, very unequal; corolla reddish-purple, 5 to 6 lines long, scarcely exceeding the calyx; capsule linear-oblong, pointed, the apex splitting, about equaling calyx-teeth, 6½ lines long, slightly constricted above a flat base, on a somewhat contorted pedicel.—Rare: Tehachapi Mts.; n. to foothills of Tulare Co.

16. **M. mohavénsis** Lem. Dwarf plants; stem simple, 1 to 2½ in. high, or well-branched, 5 in. high; herbage minutely pubescent, somewhat viscid; lower leaves oblong-lanceolate, 6 to 11 lines long; inflorescence dense, spicate; calyx strongly plicate, with triangular acuminate teeth, about 4 lines long in flower, increasing in fruit to 6 lines; floral bracts shorter than calyx; corolla with white-bordered limb and crimson throat, the throat saccate on the lower side at the point of insertion of the stamens, the proper tube short. —Desert flats or valleys, 2000 to 3000 ft., central Mohave Desert: Barstow; Calico Mts.; Ord Mts.

17. **M. leptáleus** Gray. Stem freely branched from the base, erect, 2 to 4 in. high, leafy throughout, bearing flowers in all the axils except the lowest, or towards the ends of the branches the flowers congested and the leaves reduced to bracts; plants sometimes simple-stemmed dwarfs; leaves oblong-oblanceolate to linear or lanceolate, 4 to 8 lines long, the lowest narrowed to short petioles; bracts linear, about equaling flowers; calyx in flower cylindric, a little more than 2 lines long, the lanceolate teeth 1 line long, in fruit becoming campanulate; corolla crimson or yellow, 3½ lines long with oblique limb, cylindric throat and narrow tube; capsule cylindric, bluntly pointed, sometimes slightly curved, about equaling calyx-teeth.—Montane, 7000 to 8000 ft.: Sierra Nevada from Lassen Peak to Tulare Co.

18. **M. moschàtus** Dougl. Stems weak, but ascending or erect, 6 to 10 in. high, from a perennial creeping rootstock which often ends in short tuber-like joints (shortened internodes), pubescent, the lower portion of stems and petioles of lower leaves woolly with long white hairs, musk-scented, slimy-viscid; leaves oblong-ovate, denticulate, 1 to 2 in. long, apparently pinnately veined, all petioled; calyx tubular-campanulate, with unequal ovate-acute teeth, becoming plicate-angled, a little more than half as long as the corolla-tube; pedicels in the axils of the upper leaves ascending, 1 in. long; corolla yellow, 9 to 12 lines long, slightly 2-lipped but the lobes nearly equal, rounded or slightly emarginate; capsule sessile, oblong-ovate, abruptly acuminate to the base of the persistent style, half as long as the calyx. — Stream banks and springy places, 10 to 7500 ft.: mts. throughout Cal.; n. to B. C. and Mont. (Var. longiflorus Gray.) Var. SÉSSILIFÒLIUS Gray. Fig. 865. Stems weaker or reclining, sometimes slender with long internodes, rooting at the nodes, 1 to 2 ft. long, from perennial creeping rootstocks; herbage commonly more clammy and viscid than in the species; leaves sessile or on very short petioles; calyx-teeth lanceolate, 1 to 3 lines long, sometimes ½ the length of the tube; corolla yellow, twice the length of the calyx; capsule ovate, acute.—Beside streams and springs, 10 to 4000 ft.: Santa Cruz Co. to Lake and Humboldt Cos.

865. Mimulus moschatus Dougl. var. sessilifolius Gray; *a*, fl. branchlet x ½; *b*, fl. x 1; *c*, long. sect. of corolla x 1.

19. **M. floribúndus** Dougl. Annual; stems slender, at first erect, later diffuse, (2 or) 5 to 15 in. long; herbage more or less slimy-viscid and musk-scented, more or less pubescent with cobweb-like hairs; leaves ovate, ½ to 1 in. long, dentate, short-petioled; pedicels mainly longer, sometimes shorter than the leaves; calyx narrowly campanulate (in fruit urnshaped), more or less villous, 2 to 3 lines long, the teeth acute (or in Sierra Nevada plants acuminate to subulate), ½ line long, hardly unequal; corolla light yellow, exceeding the calyx, mostly twice as long; capsule globose-ovate, obtuse to acute.—Springy places and stream shores in foothills or the mountains, 2000 to 8000 ft.: almost throughout Cal.; e. to Col., n. to B. C. May-June.

20. **M. arenàrius** Grant. Stems slender, one to several from base, pubescent, somewhat purplish, viscid, 1½ to 8 in. high; leaves 3 to 6 lines long, the basal orbicular-elliptic, petioled, the upper ovate-acute to lanceolate, subsessile; pedicels slender, divaricate, ascending, usually twice as long as the leaves; calyx narrow-campanulate, in fruit slightly urnshaped, sometimes purple-mottled, minutely hispid or almost glabrous except for the finely ciliate margins of the short, somewhat subulate calyx-teeth; corolla yellow, 5 to 7 lines long; capsule oblong-acute, ½ to ⅔ as long as calyx, apex not splitting. —Sandy banks and lake margins, 5000 to 7000 ft.: Sierra Nevada from Mariposa Co. to Fresno Co.

21. **M. bicolor** Hartw. Stem rather robust, simple to much branched, 6 to 10 (or 1½ to 10) in. high; herbage viscid-pubescent; calyx usually narrowly campanulate, strongly plicate-angled, often purplish-dotted, with acuminate somewhat subulate teeth, becoming hardened and thickened in fruit; corolla with upper lip usually white, lower yellow, the throat well bearded with yellow scale-like hairs and commonly red-dotted; capsule somewhat narrowly

rhomboidal, ½ to ⅔ as long as calyx, its walls chartaceous, somewhat wrinkled, much thinner than the closely fitting calyx; style entire, persistent, supra-placental tissue not splitting. — Montane, 2000 to 5000 ft.: Sierra Nevada from Fresno Co. to Butte Co.

22. **M. biolétti** Eastw. Similar to M. bicolor in every way, except the corolla reddish-purple, blotched with red and with yellow patches in throat. —Montane, 3400 to 6000 ft., Tuolumne Co. to Mariposa Co.

23. **M. pulsíferae** Gray. Stem simple or loosely branching with rather long internodes for the size of the plant, 2 to 6 in. high; herbage viscid but hardly pubescent; leaves ovate to lanceolate, slightly repand-dentate, 3 to 9 lines long, often purplish, contracted at base into margined petioles; calyx cylindric-campanulate, shortly toothed, 2 lines long, in fruit with tube somewhat dilated and summit contracted, 3 to 4 lines long; corolla yellow, 5 lines long; capsule oblong-ovate, equaling the calyx-tube, not splitting at apex.— Gravel bars and meadow margins, 2000 to 4500 ft.: Napa Co. to Siskiyou Co., thence se. to Plumas Co.; n. to Wash.

24. **M. látidens** Greene. Stem simple or branched from base, erect or diffuse, 2 to 12 in. high, the internodes rather long; herbage glandular, apparently glabrous though usually minutely puberulent, especially on the narrowly wing-angled stems and branches; leaves ovate to lanceolate, entire or shallowly erose-dentate, 2 to 12 lines long, the cauline usually sessile, the basal petioled; calyx cylindric, strongly plicate, the angles purplish, 2 to 3 lines long in flower, in fruit expanding below and teeth somewhat contracting, becoming inflated and ovate in outline, the teeth short, unequal, often somewhat subulate; fruiting pedicels 3 to 9 or (in rank specimens) 10 lines long; corolla nearly white or somewhat yellowish to flesh-color or pinkish, little exserted, its lobes small, almost regular; capsule elliptic, shorter than calyx, apex not splitting.—Wet depressions, foothills and valleys, 50 to 1000 ft.: Sacramento and Napa valleys to San Diego Co.

25. **M. inconspícuus** Gray. Stem rather slender, somewhat flexuous, 1 to 9 in. high, somewhat wing-angled; herbage glabrous or minutely glandular-puberulent; leaves ovate, ½ to 1 in. long, shallowly erose-dentate, the cauline sessile, the basal short-petioled; calyx-teeth acute; corolla pale pink to rose-color, 4 to 10 lines long, well exserted, its lobes deeply emarginate; capsule narrowly elliptic, the apex splitting. — Higher foothills, 2000 to 5000 ft.: Sierra Nevada from Mariposa Co. to Tulare Co.

866. Mimulus rubellus var. breweri Jepson; *a*, habit x ½; *b*, fl. x 2; *c*, stamen x 6; *d*, capsule x 2.

26. **M. rubéllus** Gray. Stem erect, with branches rather strictly ascending, 1½ to 8 in. high; herbage somewhat viscid-pubescent, rather reddish; leaves linear or lanceolate, usually entire, ½ to ¾ in. long; calyx oblong-campanulate, the reddish ribs often continued in short apiculae at the summit of the teeth, the teeth short, linear to triangular; corolla rose-color or yellow, only slightly irregular, 2 to 3 lines long; capsule oblong with abruptly acuminate summit, hardly longer than the calyx-teeth; style slender, splitting, the lower or basal part often persistent on the supra-placental tissue which divides at apex of capsule.—Montane, 6000 to 9600 ft.: San Jacinto, San Bernardino and San

Gabriel mountains; Sierra Nevada; Yollo Bolly Mts. to n. Humboldt Co.; n. to B. C., e. to N. Mex. Var. BREWERI Jepson n. comb. Fig. 866. Commonly more viscid-pubescent, 2 to 10 in. high; flowers rose-color.—Montane, 4800 to 10,000 ft.: Sierra Nevada from Tulare Co. to Siskiyou Co. (M. breweri Cov.)

27. **M. pálmeri** Gray. Stem more or less branching, 3 to 10 in. high; herbage nearly glabrous to finely pubescent, viscid; leaves lanceolate, entire or crenate, 4 to 9 lines long; pedicels slender, longer than the leaves; calyx cylindric-campanulate, 3 lines long, the teeth short, obtuse or (sometimes in same plant) acute with a subulate apex; corolla crimson to purple with yellow and purple throat markings, 6 to 10 lines long; capsule oblong, shorter than the calyx, with persistent bases of splitting style forming points at summit, the supra-placental tissue splitting.—Foothills and middle altitudes, 1000 to 5800 ft.: Sierra Nevada from Mariposa Co. to Kern Co.; s. to the San Gabriel, San Bernardino, San Jacinto, Palomar and Cuyamaca mountains.

28. **M. montioides** Gray. Stem simple or with a few lateral branches, usually weaker, ½ to 3 or 4 in. high; herbage viscid, but so minutely pubescent as to be apparently glabrous; leaves oblong to oblanceolate, 2 to 9 lines long; calyx cylindric-campanulate with short usually blunt subulate teeth, sometimes with purple markings; pedicels slender, nearly erect in flower, curving or even decumbent as fruit matures; corolla showy, yellow, commonly purple-dotted, 6 to 8 lines long, its lobes emarginate; capsule oblong with supra-placental tissue splitting at the acute summit, the splitting base of the style often persistent.—Montane, 6000 to 11,000 ft.: Sierra Nevada from Tulare Co. to Tuolumne Co.; n. to nw. Nev.

29. **M. parishii** Greene. Stems 2 in. to 2 ft. high; herbage villous, slimy-viscid; leaves lanceolate, erose-dentate, all but the basal clasping, ½ to 1½ in. long; calyx tubular-campanulate, becoming somewhat plicate, its teeth equal, short, triangular, somewhat subulate; corolla pale pink, the tone deeper in center of each lobe, or white, sometimes 2 yellow lines in open throat, 2-lipped, only the limb exserted, the equal rounded lobes emarginate; capsule oblong-ovate, equaling the calyx-tube, the supra-placental tissue splitting as also, at times, the base of the style.—Arid mts., 3000 to 6000 ft.: mostly desert bases or desert slopes of San Gabriel, San Bernardino and San Jacinto mountains; s. to L. Cal.

30. **M. prímuloides** Benth. Fig. 867. Plants 1½ to 4 (or 5) in. high, with pubescent surface stolons and glabrous creeping underground rootstocks, the stems ½ to 3 in. high; herbage more or less hairy-pubescent; leaves orbicular-elliptic to oblong, obovate or oblanceolate, ¼ to 1½ in. long; calyx campanulate, rather plicate and often a little urnshaped, glabrous except the ciliate teeth and sparsely pubescent ribs, the short-triangular teeth slightly subulate; capsule oblong, shorter than the calyx, dehiscent loculicidally, the supra-placental tissue splitting and sometimes, also, the persistent style-base.—Montane meadows, 4000 to 10,000 ft.: San Jacinto and San Bernardino mountains; Mt. Pinos; Sierra Nevada from Kern Co. to Plumas Co.; n. Lake Co. to Siskiyou Co.; n. to Ore. June-Aug.

31. **M. álsinoides** Dougl. Stems weak, becoming slightly angled, simple or diffusely branching at base, 1 to 8 in. high; herbage apparently glabrous,

867. Mimulus primuloides Benth.; *a*, habit x ½; *b*, stamen x 7; *c*, pistil x 1½.

glandular; leaves rhombic-orbicular, all shallowly erose-dentate, 1 in. long, narrowed below to a petiole; pedicels becoming ½ to 1 in. long; calyx cylindric, with blunt apiculate unequal teeth, expanding in fruit; corolla yellow, 2-lipped, with a red-purple spot in center of lower lip, well exserted, 6 to 7 lines long.—Wet banks and rocks in streams, Humboldt Co.; n. to B. C.

32. **M. láciniàtus** Gray. Stem slender, ascending, at first weak, solitary, less than 6 in. high, later stems several to many, becoming rigid from a somewhat woody base, 8 to 12 in. high; herbage mostly glabrous except on the petioles of the leaves; leaves on younger stems ½ to 1 in. long, lyrate with 1 or 2 pair of basal lobes, on older stems 1½ to 3 in. long, deeply laciniate to pinnatifid; flowers on slender curving pedicels; calyx campanulate, sharply toothed, the upper tooth largest, in fruit with the lower teeth curving toward the upper so that the calyces become gibbous; corolla yellow, 2 to 5 lines long.—Sandy beds of former streams, 4000 to 5500 ft.: Sierra Nevada from Tuolumne Co. to Tulare Co.

33. **M. guttàtus** DC. COMMON MONKEY-FLOWER. Fig. 868. Annual or perennial by the production of stolon-like stems at base; stems simple or sometimes branching, one to several from the base, about 1 to 2 ft. high; herbage glabrous or slightly pubescent; leaves more or less elliptical, thinnish, irregularly serrate or dentate, the lower petioled, the upper sessile; petioles mostly shorter than the blades; flowers in a terminal raceme; pedicels shorter than or equaling the flower; calyx in anthesis 3 to 5 lines long, in fruit often nodding, somewhat longer and nearly or quite twice as broad; calyx-teeth often disposed to be approximate or connivent in age, the upper the longer; corolla yellow, with purple or brown dots in throat, ¾ to 1½ in. long; capsule ovate, its walls thin-chartaceous.—Moist rich soil along streams and ditches, 20 to 6000 ft.: throughout Cal.; e. to Mont. and N. Mex., n. to Alas. Apr.-Aug. (M. langsdorfii Donn.) It is a highly variable but exceedingly interesting species, which in our region has developed a remarkable array of forms. Var. DEPÁUPERÀTUS Grant. Like the species but dwarfed, with slender stems 2 to 12 in. high; leaves smaller; corolla ¼ to ¾ in. long.—Stream margins and meadows, 2000 to 6000 ft.: San Jacinto Mts.; Sierra Nevada from Tulare Co. to Lassen Co.; n. to Wash., e. to Wyo. (M. luteus var. depauperatus Gray.) Var. GLAUCÉSCENS Jepson n. comb. Upper most leaves orbicular, becoming connate-perfoliate, these and adjacent cauline leaves more or less glaucous, basal leaves green.—Foothills of Sierra Nevada from Nevada Co. to Tehama Co. (M. glaucescens Greene.) Var. ARVÉNSIS Grant. Herbage usually more reddish or purplish; lower leaves often with several pairs of small leaflets near the main blade; floral leaves sometimes soft-villous; orifice of the mature calyx broad-campanulate, commonly truncate.—Low wet fields, 100 to 2500 ft.: w. Alameda Co. to Napa Valley and n. to western Colusa Co. and to Mendocino Co. Apr. (M. langsdorfii var. arvensis Jepson.) Var. NASÙTUS Jepson n. comb. Stems ½ to 1½ ft. high; herbage usually reddish or purplish; teeth of the calyx in mature fruit often very strongly turned towards the upper one which is thrice the length of the others.—Rivulets and springs, valleys and mountains, throughout Cal. (M. langsdorfii var. nasutus Jepson.)

868. Mimulus guttatus DC.; *a*, fl. branchlet x ⅓; *b*, leaves x ⅓; *c*, pistil x 1; *d*, capsule x ⅔; *e*, cross sect. of capsule x 2⅔.

34. **M. tilíngii** Regel. Stems usually several from coralloid rootstocks, 3 to 7 in. high; herbage sometimes moist but not slimy; leaves ovate to orbicular, dentate, thin, the lower ovate to cuneate, long-petioled, the upper orbicular, sessile; pedicels slender, 1 to 2 in. long; calyx campanulate; corolla 1 in. long, the middle lobe of lower lip twice the size of the lateral ones.—Mdws. and stream banks, 6000 to 9000 ft.: San Jacinto Mts.; San Bernardino Mts.; Sierra Nevada from Tulare Co. to Plumas Co.; n. to Ore., e. to Col. (M. corallinus Greene.)

35. **M. impléxus** Greene. Similar to no. 34; stems usually much tufted, arising from a mass of coralloid rootstocks, ½ to 6 in. high; herbage clammy or slimy; leaves thicker; pedicels usually as long or longer than stems; calyx spreading-campanulate, 4 lines broad, the dorsal tooth 1 line longer than the other 4, these latter with the tube 5 lines long, conspicuously purple-dotted.—On rocks in alpine stream beds, 9000 to 11,000 ft.: Sierra Nevada from Tulare Co. to Calaveras Co. and Mt. Shasta; n. to Ore.

36. **M. dentàtus** Nutt. Stems flexuous, arising from long slender perennial rootstocks, 7 to 15 in. high; herbage finely pubescent to glabrous; leaves ovate-acute, evenly and strongly serrate, 1 to 2½ in. long, the lower petioled, the upper sessile or subsessile, pinnately veined, lateral veins about 2 pair, tending to be parallel with midrib; pedicels somewhat shorter than the leaves; calyx campanulate-spreading, cleft ⅓ its length into subequal acute teeth; corolla 1 to 1½ in. long, deep yellow, the throat bearded and purple-dotted; capsule elliptic-oblong, a little shorter than calyx-tube.—Redwood belt from Humboldt Co. to Del Norte Co.; n. to Wash.

37. **M. brévipes** Benth. Stem erect, simple or branching, 1 to 2 ft. high; herbage pubescent, viscid; leaves lanceolate, the lower often broadly so, dentate or subdentate, sometimes nearly glabrous, the upper leaves narrow-to linear-lanceolate, entire; pedicels and calyces heavily pubescent; calyx sharply cleft into acuminate segments, the upper segment much exceeding the lower 4; corolla yellow, 1 to 1½ in. long; capsule ovate-acuminate, stout-walled, coriaceous, loculicidal, splitting through the axis.—Foothills and mesas, 1000 to 2000 ft.: Santa Barbara and Ventura Cos. to San Diego Co.; s. to L. Cal.

38. **M. cardinàlis** Dougl. Stems usually simple, 2 to 4 ft. high, arising from a perennial rootstock; herbage heavily pubescent, viscid; leaves erose-dentate, the upper ovate, acute, the lowest obovate-lanceolate; pedicels 1 to 3 in. long; calyx long-campanulate, its lobes nearly equal, acute; corolla scarlet, 1½ to 2 in. long, the upper lip erect with revolute lobes, the lower lip reflexed; stamens with anther-cells adorned with scale-like hairs; capsule ovate-acuminate, firm-walled, dehiscent.—Along streams and ditches, foothills and middle altitudes in the mts., 100 to 5000 ft.: almost throughout Cal.; n. to Ore., e. to Utah and Ariz.

869. Mimulus lewisii Pursh; *a*, fl. branchlet x ½; *b*, anther x 4.

39. **M. lèwisii** Pursh. Fig. 869. Stems simple, usually several from an underground rootstock, 1 to 2 ft. high; herbage viscid-pubescent; upper leaves lanceolate, remotely repand-dentate, the very lowest oblong, scale-like; pedicels 1½ to 4 in. long; calyx campanulate, its lobes acuminate; corolla rose-pink with lobes very regularly spreading; anther-cells with scale-like hairs; capsule walls less firm than in no. 38.—Moist places, 7000 to 8500 ft.: Sierra Nevada from Tulare Co. to Eldorado Co.; n. to B. C., e. to the Rocky Mts.

12. **MIMETÁNTHE** Greene

Low white-villous annual. Flowers small, yellow. Calyx short-campanulate, deeply 5-cleft, its tube slightly 5-sulcate, not prismatic-angled or even carinate. Corolla obscurely 2-lipped, its lobes plane. Stamens 4, 2 fertile, or all 4 fertile. Capsule pointed, loculicidal, dehiscent the whole length of the upper side and on the lower side along the apical attenuation; placentae tardily separating, borne on the shortly 2-cleft valves. (Greek mimetes, an imitator, and anthos, blossom, on account of the resemblance to Mimulus.)

1. **M. pilosa** (Benth.) Greene. Stem erect, at length much branched, leafy, flowering from near the base, mostly about 8 to 10 in. high; herbage glandular-viscid and with disagreeable solanaceous odor; leaves lanceolate or narrowly oblong-ovate, entire, sessile; flowers on slender pedicels, the lower pedicels surpassing the leaves; upper tooth of calyx often longer than the others, equaling the tube; corolla bright yellow, its lower lobe usually with brown spots, slightly exceeding the calyx, 3 to 4 lines long; capsule oblong-ovate, attenuate.—Moist summer beds of winter streams, 100 to 2500 ft.: throughout Cal.; Ore. to Nev. and Ariz. July-Sept. (Mimulus pilosus Wats. M. exilis Dur.)

13. **LIMOSÉLLA** L. Mudwort

Diminutive tufted annuals. Stems creeping in the mud (never ascending), bearing at intervals clusters of leaves and scapes. Leaves narrow, entire, fleshy. Scapes naked, 1-flowered. Calyx 5-toothed Corolla nearly regular, open-campanulate, 5-cleft. Stamens 4, all fertile. Style short. Capsule globose, 2-celled only at base, many-seeded. (Latin limus, mud, and sella, seat, the species growing in moist localities.)

1. **L. aquática** L. Tufts 1 to 2 in. high; leaves exceeding the scapes, narrowly oblong, 3 to 6 lines long, on long petioles (½ to 1½ in.); corolla very small (less than 1 line long), white or purplish.—Muddy shores of lakes and ponds, mostly near the coast, from Marin Co. to Kern Co. and San Jacinto Mts. It is found in all continents, the most widely distributed species of the family. June-July. Var. TENUIFÒLIA Hoffm. Leaves narrowly linear (no distinction of blade and petiole).—San Bernardino Mts.

14. **STEMÒDIA** L.

Viscid-pubescent herbs with opposite or whorled leaves. Flowers solitary in the axils, sometimes becoming spicate or racemose at the ends of the stems. Calyx deeply 5-parted, the lobes narrow and nearly equal. Corolla with short cylindric tube, the upper lip 2-lobed, the lower 3-parted. Stamens 4, included. Anther-cells separate and stipitate. Stigma 2-lobed. Capsule with valves entire or at length 2-parted, the placentae left in the axis. Seeds numerous. (Abbreviated from Greek stemon, stamen, and diaera, two tips, in reference to the separated anther-cells.)

1. **S. durantifòlia** Swartz. Annual or perennial; stems simple or branched below, 8 to 14 in. high; herbage glandular-pubescent; leaves opposite or whorled, lanceolate, serrate, narrowed below and with a dilated partly clasping base, ½ to 1 in. long; inflorescence spike-like, densely glandular; calyx with 2 bractlets; corolla purplish, 3 to 4 lines long, hairy within.—Wet ground, San Diego to w. side Colorado Desert; s. Ariz.; trop. Am.

15. **BACÒPA** Aublet

Perennial herbs with opposite leaves and solitary axillary flowers. Calyx of 5 almost distinct imbricated sepals, the upper broadest. Corolla campanulate, its upper lip emarginate or 2-lobed, the lower 3-lobed. Stamens 4, all fertile. Capsule thin, 2-valved, the valves 2-parted. Placentae remaining united in the axis, the valves of the capsule separating from them. (Thought to be an aboriginal name.)

1. **B. rotundifòlia** (Michx.) Wettst. Stems succulent, creeping, 10 to 14 in. long, villous-pubescent or almost glabrous; leaves rotund, sessile, flabellately many-nerved from the base, ½ in. long; pedicels 1 or 2 in the axils, longer than the white flowers; corolla little irregular.—Aquatic or in muddy situations: San Joaquin Valley (Stockton to Fresno); e. to Tex., thence n. to Ill. (Herpestis rotundifolia Pursh. Monnieria rotundifolia Michx.)

16. GRATÌOLA L.

Low annual with opposite sessile leaves. Flowers solitary in the axils, peduncled. Calyx of 5 almost distinct unequal sepals. Corolla tubular, the tube yellow, the white lips short; upper lip entire or bifid, the lower 3-cleft. Anther-bearing stamens 2, posterior; anterior pair none or reduced to sterile rudiments. Stigma dilated or with 2 flat lobes. Capsule 4-valved, the valves separating from the placenta-bearing axis. (Latin gratia, grace or esteem, in reference to its medicinal virtues.)

Calyx with a pair of foliaceous bractlets close to it; corolla about 2 times as long as the calyx ..... 1. *G. virginiana.*
Calyx without bractlets; corolla shorter than or equaling the calyx..... 2. *G. ebracteata.*

1. **G. vírginiàna** L. Stems 3 to 6 in. high, erect, branched from below, puberulent, somewhat viscid; leaves glabrous, oblong-lanceolate, acute, entire or toothed, glabrous, 1 to 1½ in. long; corolla yellow with white lips, 4 lines long; stamen rudiments minute or none; capsule ovate, about equaling the calyx.—Montane, 5500 to 6500 ft.: rare, Placer Co.; e. to the Atlantic. July.

2. **G. ebracteàta** Benth. WALLOW-HYSSOP. Stems somewhat succulent, ascending, 2 to 5 in. high; herbage obscurely glandular-pubescent; leaves lanceolate, entire, 3 to 8 lines long; sepals lanceolate, 2 to 3½ lines long, surpassing the globular and somewhat 4-angled capsule; upper corolla lip shortly bifid, with a patch of short glandular hairs beneath the notch, the lobes of the lower lip short and broad, notched.—Wet soil, 200 to 5000 ft.: North Coast Range valleys; Sierra Nevada from Tuolumne Co. to Lassen Co.; n. to Wash.

17. ILYSÁNTHES Raf.

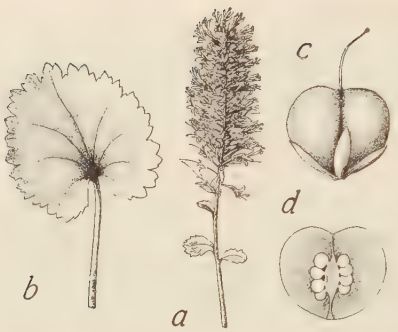
Small annuals with opposite sessile leaves. Flowers small, axillary, on filiform naked peduncles (or the upper becoming racemose). Calyx of 5 almost distinct sepals. Corolla tubular; upper lip short, erect, 2-cleft; lower lip larger, spreading, 3-cleft. Fertile stamens 2, posterior, inserted low down; anterior stamens sterile, inserted high in the throat, forked, one of the divisions glandular and obtuse, the other acute and sometimes bearing the rudiment of an anther. Stigma 2-lobed. Capsule many-seeded, septicidal or septifragal. (Greek ilus, mud, and anthos, flower, the species a denizen of wet places.)

1. **I. dùbia** Barnh. Stems one to several from the base, very slender, diffusely branching, 3 to 5 in. high; herbage essentially glabrous; leaves ovate or oblong, 4 to 7 lines long, sparingly denticulate or entire; peduncles long and slender, several times longer than the flowers, solitary in the axils or subracemose above by the reduction of the subtending leaves to bracts; calyx 1 line long; corolla 3 to 4 lines long, bluish.—Moist stream bottoms or valley lowlands, 10 to 4000 ft., rare in Cal.: lower Sacramento and San Joaquin valleys; Yosemite; e. to Atlantic; S. Am. July-Sept. (I. gratioiloides Benth.)

18. SÝNTHYRIS Benth.

Perennial herbs from rootstocks with the rounded petioled leaves in a basal tuft. Flowers racemose. Calyx 4-parted. Corolla with very short tube and 4-lobed rotate-campanulate limb. Stamens 2, inserted close to the upper sinuses, exserted. Anther cells parallel, not confluent. Capsule compressed, loculicidal. (Greek sun, together, and thuris, a little door, re-

870. Synthyris rotundifolia Gray; *a*, habit x ½; *b*, capsule x 1½; *c*, sect. of capsule x 1½



871. Synthyris reniformis Benth.; *a*, fl. branchlet x ⅔; *b*, leaf x ⅔; *c*, capsule x 2; *d*, long. sect. of capsule x 2.

ferring to the continued adherence of the base of the valves to the placentae.)

Herbage appressed-scabrulose; capsule divaricately 2-lobed; seeds 2 in each cell.....1. *S. rotundifolia.*
Herbage glabrous; capsule emarginate; seeds more than 2 in each cell.....
2. *S. reniformis.*

1. **S. rotundifòlia** Gray. Fig. 870. Plants 2½ to 5 in. high; herbage appressed-scabrulose; leaves roundish- or ovate-cordate, doubly crenate, ½ to 2 in. long, shorter than the petioles; peduncles scarcely longer than the leaves; inflorescence loosely corymbose-racemose, the bracts small and the pedicels, at least the lower, several times longer than the flowers; corolla white, 2 lines long, its tube hairy within.—North Coast Ranges from Marin Co. to Humboldt Co.; n. to Ore. Mar.-May.

2. **S. renifórmis** Benth. Fig. 871. Flowering stems 4 to 9 in. high, bearing several bract-like fanshaped leaves; basal leaves persistent, orbicular-reniform, 1 to 2 in. wide, crenate and crenately incised, the lobes sharply toothed; petioles stout, 2 to 4 in. long; raceme dense; pedicels slender, exceeded by the subtending lanceolate bracts; calyx-lobes lanceolate, somewhat unequal, about 1 line long; corolla blue changing to purple, 3 lines long, its tube seldom hairy within; capsule truncate, emarginate.—Modoc Co.; n. to Wash. and Ida. July.

19. **VERÓNICA** L. Speedwell

Ours herbs with cauline leaves and flowers in axillary or terminal racemes, or solitary. Pedicels without bractlets. Calyx in ours 4-parted. Corolla subrotate, deeply 4-cleft, the upper lobe commonly broader than the lateral lobes or the lower one. Stamens 2, one on each side of the upper corolla-lobe, exserted. Stigma entire. Capsule flattened, emarginate, obcordate or 2-lobed, septicidal. Seeds few to many. (Name thought to be in memory of St. Veronica.)

A. Perennials from rootstocks or stolons; leaves opposite; flowers borne in racemes.

Racemes several, axillary; corolla pale blue, often purple-striped.
Leaves all or mostly short-petiolate.....1. *V. americana.*
Leaves all sessile.
Racemes loose and elongate, commonly from opposite axils; capsule orbicular, emarginate, many-seeded; seeds compressed or plano-convex.....
2. *V. anagallis.*
Racemes filiform, flexuous, commonly from alternate axils; capsule biscutelliform, deeply emarginate, several-seeded; seeds very flat.....3. *V. scutellata.*
Raceme one, terminal.
Pedicels longer than bracts.....4. *V. cusickii.*
Pedicels equaling or shorter than the bracts.
Pedicels shorter than bracts; stamens close to the upper sinuses; capsule elliptical, emarginate .....5. *V. alpina.*
Pedicels equaling or shorter than bracts; stamens borne midway between the upper sinuses and the base of the corolla-tube; capsule somewhat orbicular, obcordate .....6. *V. serpyllifolia.*

B. Annuals; leaves alternate or the lowest opposite; flowers solitary in the axils of the leaves, or the inflorescence appearing racemose above by the reduction of the upper leaves to bracts.

Pedicels longer than the leaves; lobes of capsule strongly divergent.....7. *V. buxbaumii.*
Pedicels shorter than the leaves; capsule obcordate, its lobes not divergent.
Stem and branches erect; lower leaves oblong or oval, entire or dentate. 8. *V. peregrina.*
Stem and branches soon spreading; lower leaves ovate, crenate.....9. *V. arvensis.*

1. **V. americàna** Schwein. American Brooklime. Fig. 872. Stems branching, erect or ascending, ½ to 2½ ft. high; herbage glabrous, leaves ovate or oblong, serrate, 1 to 3 in. long; pedicels filiform, exceeding the linear-oblong

bracts and much longer than the rotund capsule; calyx-segments 1 to 1½ lines long; corolla bright blue with white center, 2 lines broad; capsule biconvex, slightly emarginate at the apex, 1½ lines long; seeds many, flat, borne on a short placental surface at the center of the axis. —Springs and rivulets in the hills and mountains, throughout cismontane Cal.; far e. and n. June-Sept.

872. Veronica americana Schwein.; *a*, fl. branchlet x ½; *b*, capsule x 1½.

2. **V. anagállis** L. Stem 6 to 10 in. high, simple or branching; herbage glabrous or the inflorescence glandular-puberulent; leaves lanceolate, remotely serrate, 1 to 2 in. long; racemes short, few-flowered; peduncles and pedicels filiform, the latter 2 to 4 lines long, exceeding the lanceolate bracts; calyx-segments barely 1 line long, exceeded by the corolla-lobes; corolla blue or purplish-striped. — Rivulets or swamps, rare in Cal.; Shasta Co.; N. Am.; Eur., Asia. May.

3. **V. scutellàta** L. Fig. 873. Stems slender, 3 to 16 in. high, simple or somewhat branched; herbage glabrous or sparingly hairy; leaves linear or linear-lanceolate, remotely denticulate or entire, ½ to 2½ in. long; racemes equaling or exceeding the leaves; bracts lanceolate, 1 line long, exceeding the calyx-segments; pedicels several times as long as the bracts, slender, spreading; corolla blue, its lobes 2 lines long, equal; stamens inserted between upper sinuses and base of corolla-tube; capsule 1½ lines long; seeds 6 to 8 in each cell; placental surface located toward upper end of axis.—Common in wet places: Sierra Nevada; North Coast Ranges; n. to B. C., e. to Lab.; Eur., Asia. June-July.

873. Veronica scutellata L.; *a*, sect. of fl. branchlet x ½; *b*, capsule x 1½.

4. **V. cusíckii** Gray. Stems slender, simple, erect, 8 or 9 in. high; herbage glabrous or pubescent; leaves sessile, suborbicular below, ovate or oblong above, entire, 4 to 8 lines long; raceme 3 to 9-flowered; bracts 1½ to 2 lines long, equaling calyx-segments; corolla 4 to 5 lines broad, with ample rounded lobes; stamens borne in upper sinuses, exserted together with the filiform style; capsule elliptical, emarginate; seeds many. — Siskiyou Co.; n. to Ore. Aug.

5. **V. alpìna** L. var. **unalaschénsis** C. & S. Alpine Speedwell. Stems slender, 4½ to 10½ in. high, erect or procumbent at base; herbage hirsute-pubescent to glabrate; leaves ovate or oblong, crenulate-serrate to entire, obtuse, sessile, ½ to 1½ in. long; raceme simple, dense or interrupted below; pedicels shorter than calyx-lobes; corolla light blue, 2 to 3 lines broad; stamens and style included; placental surface centrally located on axis; seeds numerous.—Montane meadows, 4000 to 8000 ft.: Sierra Nevada from Tulare Co. to Lassen Co.; n. to Alas., e. to N. Eng. July-Sept.

6. **V. serpýllifòlia** L. Thyme-leaf Speedwell. Stems 2 to 11 in. high, simple or branching at base; herbage glabrous or pubescent; leaves sessile or petiolate, ovate or oblong, entire or crenulate, 3 to 10 lines long; raceme loose, few to many-flowered; bracts ovate to linear; pedicels erect, filiform, as long as the calyx; calyx-lobes 1 to 1½ lines long; corolla pale blue (with darker stripes) to almost white, 2 lines broad; stamens together with the filiform style exserted; stigma capitate; capsule 1½ lines long; seeds many,

874. Veronica peregrina L.; *a*, habit x ½; *b*, capsule x 1½.

flat, oblong, borne on placentae located at center of axis. —Montane, 3000 to 6000 ft.: throughout Cal.; n. to Alas., e. to Lab. and Ga.; S. Am., Eur., Asia. May-Aug.

7. **V. buxbáumii** Tenore. Stems branched from the base, ½ to 1 ft. long, diffuse or procumbent; herbage pubescent with spreading hairs; leaves roundish or oval, often broader than long, 5 to 7 lines long, on petioles 1 to 3 lines long, rather deeply toothed above the base; corolla blue with a small white center, 2½ to 3 lines broad, its short tube closed with a barrier of hairs; upper and lateral lobes subequal, larger than the lower lobe; filaments thick-fleshy; capsule 4 lines broad, with two strongly divergent lobes, appearing as if twins; placentae near the upper end of the axis; seeds about 9 in each cell, oblong or roundish, wrinkled, with a fissure on one side, 1 line long.—Native of Eur., escaped from gardens: Eel River valley; Woodland; Newark; San Bernardino. Apr.

8. **V. peregrina** L. NECKWEED. Fig. 874. Stem erect, 4 to 12 in. high, simple or branched from the base; herbage finely puberulent; leaves alternate or the lowest opposite, oblong, ⅛ to 1 in. long, entire or dentate, only the lowest petioled; flowers solitary in the axils of the alternate leaves, sometimes in one of the axils of the opposite leaves, appearing racemose above by the reduction of the upper leaves to bracts; pedicels shorter than the small flowers or capsules; corolla white; stamens and short style not exserted; capsule orbicular, 1½ lines long; seeds oblong, flat, 8 or 10 in a cell; placentae central to axis. — Low places in valley fields, 50 to 4000 ft.: throughout Cal.; N. Am., S. Am. Mar.-July.

875. Veronica arvensis L.; *a*, lower cauline leaves x 2; *b*, capsule x 6.

9. **V. arvénsis** L. CORN SPEEDWELL. Fig. 875. Stems slender, simple or branched, erect or slightly decumbent at base, 3 to 10 in. long; herbage pubescent; leaves ovate to lanceolate, 3 to 4 lines long; calyx-segments lanceolate, 1½ lines long, glandular-hairy; corolla shorter than calyx; capsule 1 to 1½ lines long, ciliate; placentae above center of axis; seeds numerous, flat.—Native of Eur., an escape from gardens: Humboldt Co.; Siskiyou Co. Mar.-June.

20. DIGITÀLIS L.

Tall biennial with alternate leaves, topped by long terminal commonly 1-sided racemes of showy flowers. Calyx 5-parted. Corolla with inflated tube and very short limb. Stamens 4, included. (Latin digitalis, referring to the fingers of a glove, which the tubular corollas remotely resemble.)

1. **D. purpúrea** L. FOXGLOVE. Stem stout, 3 to 4 ft. high; herbage pubescent; leaves oblong-lanceolate, crenate, 3 to 7 (or 8) in. long; corolla white or purple, declined, 1½ in. long.—European garden plant, naturalized on the Humboldt and Mendocino coasts.

21. CASTILLÈIA Mutis

By ELSIE M. ZEILE

Root-parasitic herbs or sometimes suffrutescent plants, of hilly districts. Leaves alternate, sessile, entire or more commonly laciniate. Flowers dull yellowish or greenish, in terminal spikes (sometimes pediceled). Bracts and calyx-lobes scarlet, red or yellow, commonly more showy than the dull yellow, red or greenish corolla. Calyx tubular, flattened laterally, cleft before and usually behind (in one species on the side), the divisions entire, emarginate or 2-cleft. Upper lip (galea) of the corolla long and narrow, flattened laterally (or conduplicate) and enclosing the style and the 4 unequal stamens. Lower

lip very short, 3-lobed or -toothed. Anther cells unequal, the outer versatile, the inner pendulous. Capsule many-seeded. (D. Castillejo, Spanish botanist.)

A. Annuals; upper bracts linear, red, longer than flowers; leaves linear-lanceolate; flowers pediceled; calyx about equally cleft before and behind.

Corolla 1 to 1½ in. long; galea well exserted beyond the calyx, equaling the corolla-tube; lower lip exposed.....1. *C. stenantha.*
Corolla ½ to ¾ (or 1) in. long; galea slightly exserted, about ⅓ as long as the corolla-tube; lower lip not or scarcely protruding beyond the cleft of the calyx.....2. *C. minor.*

B. Perennials.

Calyx about equally cleft before and behind (but see no. 3).
Galea included or somewhat exserted, the lower lip never or scarcely exposed.
Spikes strict; leaves mostly laciniate.
Calyx cleft at the sides deeper than before or behind, floccose-tipped, its lobes 2-cleft, the inner or lower lobes shorter than the outer or upper ones; S. Cal.....3. *C. plagiotoma.*
Calyx equally cleft before and behind, not floccose-tipped, its lobes equally cleft ⅓ the length of calyx; Marin Co.....4. *C. neglecta.*
Spikes broad.
Plants 2 to 8 in. high from a thick caudex; galea very short, shorter than corolla-tube; high montane.
Leaves mostly entire; herbage pubescent; upper leaves 1-nerved.....
5. *C. culbertsonii.*
Leaves mostly laciniate; herbage hispid; upper leaves 3-nerved.....
6. *C. breweri.*
Plants mostly over 8 in. high; galea about equaling tube.
Calyx-lobes mostly 2-cleft to the middle, or rarely 2-toothed; upper bracts deeply cleft.
Calyx cleft to middle; herbage villous-hirsute (puberulent in var.)..
7. *C. parviflora.*
Calyx cleft ⅓ or less its length.
Herbage pilose-hispid; leaves mostly laciniate; mostly of Great Basin or of desert region.....8. *C. angustifolia.*
Herbage cinereous; leaves mostly entire, lanceolate; n. Cal...
9. *C. pruinosa.*
Calyx-lobes entire or with slightly 2-lobed summit.
Leaves oval or obovate (or broadly lanceolate in var.); herbage viscid-pubescent; calyx cleft to middle; coastal.....
10. *C. latifolia.*
Leaves linear to lanceolate; calyx cleft ⅓ or less its length; suffrutescent; herbage white-woolly.
Galea scarcely exserted; common throughout Cal.....
11. *C. foliolosa.*
Galea somewhat exserted; Santa Barbara Isls.....
12. *C. hololeuca.*
Galea conspicuously exserted (but tardily exserted in no. 15), about equaling the tube, the lower lip usually exposed; montane.
Bracts much longer than calyx; spikes showy, broad; calyx cleft a little deeper before than behind, the lobes deeply linear-cleft.....13. *C. miniata.*
Bracts about equaling calyx; spikes long and narrow (broadened at top in no. 15); calyx equally cleft, the lobes 2-toothed.
Leaves mostly entire, linear to oblong-linear, 1 to 3-nerved; bracts narrow; Sierra Nevada and n.....14. *C. pinetorum.*
Leaves mostly trifid, broadly linear to ovate, 3 to 5-nerved; bracts broad; S. Cal.....15. *C. oblongifolia.*
Calyx much more deeply cleft before than behind; galea well exserted, the lower lip exposed; leaves mostly entire (except in var.).....16. *C. affinis.*

1. **C. stenántha** Gray. Stem simple, erect, virgate, 1¼ to 2½ ft. high, the whole plant glandular-pubescent and wet as if with dew; leaves ascending, linear-lanceolate, 1½ to 3 in. long, all entire; lower leaves with long linear tips, these coiling spirally when wilting; bracts linear, entire, the uppermost with scarlet tips; lower flowers pedicellate; calyx equally cleft or cleft slightly deeper behind; calyx-lobes incisely 2-cleft at apex; corolla wholly green (except the lower lip) or sometimes slightly yellowish, straight, well-exserted from calyx-tube, exposing the bright scarlet teeth of the lower lip; corolla-tube equaling the galea.—Moist rivulets in the mts., 1000 to 7000 ft.: Lake and Napa Cos.; Ventura Co. to w. Riverside Co.

2. **C. minor** Gray. Similar to no. 1 but not so tall; corolla shorter, the galea only slightly exserted.—Montane, 5000 to 7500 ft.: Mariposa and Tulare Cos.; Inyo Range.

3. **C. plagiótoma** Gray. Stems erect or spreading, 1 to 1¼ ft. high; herbage more or less woolly-pubescent, the inflorescence white-woolly; lowest

leaves linear, the upper divided to the middle into 3 linear lobes, the middle lobe broadest; spikes narrow; flowers ascending, distant; upper bracts green, shorter than the calyx, cleft more than half way, the middle lobe broadest; calyx floccose-tipped, about equaling the corolla; corolla yellow, 6 to 8 lines long, the upper lip emarginate; galea not or scarcely protruding, as long as the tube.—Montane, 3500 to 5500 ft.: w. side Mohave Desert; San Gabriel Mts.

4. **C. neglécta** Zeile n. sp. Near no. 10 but the herbage puberulent, not viscid, and the spikes erect, slender and narrow; leaves linear to ovate, laciniate; upper bracts broad, yellow, often tipped with red, deeply cleft, the middle lobe broadest; lower flowers pediceled; calyx-lobes broadly cleft ⅓ the length of calyx; corolla frequently red; galea scarcely exserted, shorter than the tube.—Hillsides, Tiburon, Marin Co. (K. Brandegee, type).

5. **C. culbertsònii** Greene. Stems erect, simple from the base, solitary or when several a little remote; leaves linear, ½ to 1 in. long, somewhat appressed to the stem; spikes and flowers large for the size of the plant, the spikes as if forked at the apex; floral bracts thin, longer than the flowers, cleft to middle or below, the lobes red, middle lobe broad, lateral lobes linear; galea not or scarcely exserted, not much longer than the lower lip and very much shorter than the corolla-tube.—Alpine or montane meadows, 10,000 to 11,000 ft.: Tulare Co. to Mariposa Co.

6. **C. brèweri** Fer. Erect alpine plants 4 to 6 in. high, the few lowest leaves entire, the upper divided into 3 lobes, the middle lobe broadest; galea scarcely exserted, very short, scarcely half as long as tube.—High montane, 10,500 to 11,000 ft.: Mariposa Co.; Modoc Co.

7. **C. parviflòra** Bong. var. **douglásii** Jepson. INDIAN PAINT BRUSH. Stems from base rather few; herbage villous-hirsute; leaves linear, varying to linear-lanceolate or -oblong, 1½ to 3½ in. long, entire or with a few linear-laciniate lobes, the lower often entire; bracts petal-like above, equally 3-parted or the middle lobe somewhat larger and 3-cleft at summit; spikes lax below; calyx-lobes colored red, rarely yellow, laciniately 2-cleft at summit or to below the middle; corolla straight, the galea about as long as tube, little or not at all exserted.—Wooded cañons, 100 to 7000 ft.: Los Angeles and Ventura Cos. to Humboldt Co.; Placer Co. to Shasta, Modoc and Siskiyou Cos. Var. CALIFÓRNICA Zeile n. comb. Stems erect, slender, 8 to 15 in. high; herbage puberulent; spikes compact, 1 in. long in flower, as much as 6 in. long in fruit, the capsules distant; calyx cleft almost to middle, each lobe 2-toothed; corolla subfalcate, galea a little shorter than tube.—Coastal mts. of S. Cal. (C. californica Abrams.)

876. Castilleia latifolia H. & A.; *a*, fl. branchlet x ½; *b*, two views of fl. x 1; *c*, fl. with calyx removed x 1; *d*, capsule x 1.

8. **C. angústifòlia** G. Don. Stems erect, mostly simple, 7 to 12 in. high, arising from a caudex; herbage pilose-hispid; leaves cleft mostly to below the middle into linear lobes, tending to spread widely; calyx cleft ⅓ its length, the lobes 2-toothed; upper bracts cleft to or below the middle, the outer lobes linear, the middle lobe broad and often 3-cleft, spikes dense, 1 to 1½ in. long; galea slightly exserted, about equaling tube; capsules 4 to 5 lines broad, 6 to 9 lines long.—Desert ranges and arid slopes of mts. bordering the deserts, 2800 to 6000 ft.: Colorado and Mohave deserts; n. Sierra Nevada; Inyo Co.; e. to Great Basin.

9. **C. pruinòsa** Fer. Stems erect, mostly simple, sometimes branching above, 12 to 16 in. high; herbage pubescent-cinereous; leaves entire, linear to lanceolate, 1 to 3 in. long; bracts 3-lobed above the middle, longer than the calyx; calyx equally cleft ⅓ its length, lobes 2-cleft not quite to middle; galea exserted, almost equaling the tube, the lower lip not protruding.—Siskiyou Co.

10. **C. latifòlia** H. & A. Seaside Painted Cup. Fig. 876. Stems ½ to 1½ ft. high; herbage viscid-pubescent; leaves thick, oval or obovate or sometimes narrower, mostly less than 1 in. long, or the upper larger and 3-lobed at apex; bracts sometimes yellow, shorter than flowers, broad (about 9 lines long and 5 lines wide) with oblong lobes, the middle lobe twice as large as the lateral; calyx-lobes broad, entire or notched at apex, almost equaling the corolla; corolla 9 to 12 lines long; lower lip very short.—Sea cliffs and rocky headlands along the coast, 10 to 500 ft.: Monterey Co. to Mendocino Co. Var. wíghtii Zeile n. comb. Stems more or less densely branched above, very leafy, herbage more densely viscid-pubescent; spikes erect, narrower and longer than in the species; flower structure similar to the species, but the bracts and calyx tipped with yellow.—Near coast, San Mateo Co. (C. wightii Elmer.)

877. Castilleia foliolosa H. & A.; *a*, fl. stem x ½; *b*, fl. x 1; *c*, fl. with calyx removed x 1.

878. Castilleia miniata Dougl.; *a*, fl. branchlet x 1; *b*, fl. x 1; *c*, fl. with calyx removed x 1; *d*, anther x 3.

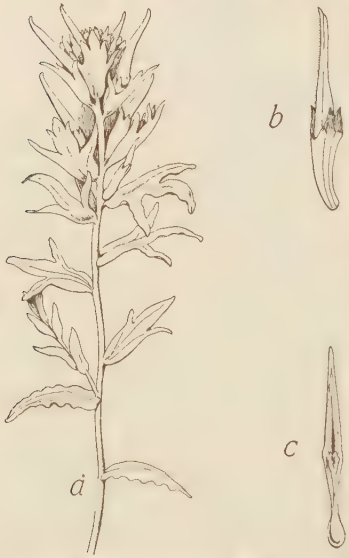
11. **C. fòliolòsa** H. & A. Woolly Painted Cup. Fig. 877. Suffrutescent, with many stems from the base, mostly 10 to 18 in. high, white-woolly throughout; leaves linear and entire, rather crowded below and fascicled in the lower axils, 4 to 12 lines long, the upper cauline and bracts 3-parted into linear lobes; bracts with lobes spatulate-dilated at apex, the middle lobe largest and again shallowly 3-lobed; spikes dense; flowers about 9 lines long, only slightly curved; galea protruding from calyx only 1 or 2 lines, shorter than or as long as tube of corolla; calyx-lobes truncate or merely retuse; capsule 5 to 7 lines long; seeds bluish-green.—Dry hills, 200 to 4500 ft., mostly in rocky situations or gravelly soil, in some places exceedingly abundant, occupying many acres of open hillside: San Diego Co. to Solano and Mendocino Cos.; Amador Co. to Eldorado Co. Apr.-May.

12. **C. hololeùca** Greene. Shrubby, 2 to 4 ft. high, densely white-woolly; leaves ½ to 1½ in. long; bracts

narrow, entire or the upper ones 3-cleft; calyx 8 lines long, cleft deeper on the upper side; galea shorter than tube.—San Clemente, Santa Rosa, Santa Cruz, and Santa Catalina islands.

13. **C. miniàta** Dougl. Fig. 878. Stems erect, branched above, 1 to 3 ft. high; herbage pubescent to nearly glabrous; leaves 1 to 2 in. long, acuminate; inflorescence hairy; spikes dense and short, 1 to 2½ in. long in flower, lengthening in fruit, showy; calyx-lobes deeply cleft into linear lobes; corolla 1 to 1½ in. long, falcate, the galea exserted, longer than tube.—Montane, in wet places, 3500 to 10,000 ft.: San Jacinto Mts.; San Bernardino Mts.; San Gabriel Mts.; Sierra Nevada from Tulare Co. to Plumas Co., thence to Siskiyou and Humboldt Cos.; n. to Alas., e. to Col. (C. montana Congdon. C. oreopola Greenm.)

14. **C. pinetórum** Fer. Fig. 879. Stems erect, often branching above, 6 to 12 in. high from a woody caudex; herbage pilose-glandular; leaves oblong-linear, entire or sometimes trisected, ½ to 1 in. long; spikes narrow; bracts divided to middle, the 2 outer linear, the middle lanceolate, all about equaling the calyx; calyx cleft equally ⅓ or ½ its length, the lobes 2-toothed; galea about equaling the tube.—Montane, 4000 to 9000 ft.: Sierra Nevada from Plumas Co. to Tulare Co., s. to the San Gabriel, San Jacinto and Cuyamaca mountains. (C. trisecta Greene.) Var. FRÁGILIS Zeile n. comb. Stems very slender, branched from base and above; leaves entire or laciniate into 3 lobes at apex, prominently 1 to 3-ribbed beneath; spikes very narrow, 2 to 5 lines broad.—Siskiyou Co. (C. fragilis Eastw.)



879. Castilleia pinetorum Fer.; *a*, fl. stem x ½; *b*, fl. x 1; *c*, fl. with calyx removed x 1.

15. **C. oblóngifolia** Gray. Similar to no. 14; herbage less viscid; leaves 1 to 2 in. long, 3 to 8 lines broad, mostly divided nearly to the middle into 3 spreading lobes, the middle one broadest; bracts thin, similarly cleft, equaling calyx or a little longer; calyx equally cleft before and behind, about ⅓ its length, the lobes 2-toothed; galea equaling or slightly longer than tube, lower lip at length exserted.—Montane, San Diego and San Bernardino Cos. (C. martini Abrams.)

16. **C. áffinis** H. & A. SCARLET CUP. Stems 1 to 2 ft. high, with few virgate branches from the base, rather leafy below; herbage nearly glabrous, somewhat villous, or slightly scabrous-puberulent; leaves linear to lanceolate, entire, 1 to 4 in. long, the lower with 3 strong callous nerves; raceme loose below; bracts scarlet, very long, 3 parted, the lobes rather narrow, not broader above, the middle lobe largest and 3 cleft at apex; flowers pedicelled, 1¼ in. long; calyx-lobes notched or 2-cleft at apex, the teeth acute; corolla yellowish, falcate, much exserted from the anterior cleft of the scarlet or scarlet-tipped calyx, and exposing the lower lip; galea about as long as tube, villous, bearded towards apex on the back.—Borders of woods, 10 to 500 ft.: San Diego Co. to Napa and Humboldt Cos.: extending e. to Kern Co. and ascending to 8300 ft. Var. LINÁRIAEFOLIA Zeile n. comb. Stems simple, erect from a woody crown; herbage glabrous, inflorescence a little pubescent; leaves linear, ½ to 3 in. long, the upper in fascicles, sometimes divided to below the middle into 3 linear lobes.—Montane, 4000 to 8500 ft.: Sierra Nevada from Modoc Co. to Kern Co. and s. to Los Angeles Co. (C. linariaefolia Benth.)

22. ORTHOCÁRPUS Nutt. OWL'S CLOVER

Annual herbs, or 3 species perennial. Leaves sessile, mainly alternate, entire, incised or laciniate, the floral frequently colored. Flowers in terminal

spikes. Calyx tubular or short-campanulate, 4-cleft, or cleft before and behind and the divisions 2-lobed. Corolla tubular, the upper lip (galea) snout-like, but not greatly (or not at all) exceeding the lower one. Lower lip more or less 3-saccate, inflated, often very conspicuous. Stamens 4; anthers 1 or 2-celled. (Greek orthos, upright, and karpos, fruit.)

A. Perennials; lower lip of corolla not saccate or only slightly so; anthers 2-celled.—Subgenus COLACUS.

Leaves entire or mostly so; rare.
Middle lobe of bracts spatulate-dilated, very obtuse; S. Cal. ..... 1. *O. cinereus.*
Middle lobe of bracts lanceolate, acute; Siskiyou Co. ..... 2. *O. schizotrichus.*
Leaves cleft or divided; common ..... 3. *O. pilosus.*

B. Annuals; lower lip of corolla saccate.—Subgenus EUORTHOCARPUS.

1. ANTHERS 1-CELLED.

Seeds with a close coat.
Stamens in anthesis exserted from galea; flowers not more than ½ in. long.
Stems 2 to 4 in. high, weak; flowers scattered, the corolla 2 to 3 lines long, dark red, inconspicuous ..... 4. *O. pusillus.*
Stems 5 to 12 in. high, more vigorous; flowers mostly in dense spikes, the corolla 6 lines long, cream-color or yellow ..... 5. *O. floribundus.*
Stamens in anthesis not exserted from galea (except in a var. of no. 7); flowers mostly more than ½ in. long.
Herbage greenish; corolla yellow or white, the galea whitish .. 6. *O. faucibarbatus.*
Herbage more or less purplish; galea purple.
Corolla sulphur-yellow ..... 7. *O. erianthus.*
Corolla white or pink or parti-colored; vars. of ..... 7. *O. erianthus.*
Seeds with a loose cellular coat; corolla golden yellow with purple galea ..... 8. *O. bidwelliae.*

2. ANTHERS 2-CELLED.

a. Corolla more or less 3-saccate.

Bracts herbaceous.
Bracts entire ..... 9. *O. campestris.*
Bracts cleft into linear or lanceolate lobes.
Lower lip of corolla very broad, the sacs 2½ to 3 lines deep, deeper horizontally than long ..... 10. *O. lithospermoides.*
Lower lip of corolla less broad, the sacs not deeper horizontally than long.
Galea densely white-villous; corolla 1 in. long ..... 11. O. *lasiorhynchus.*
Galea not white-villous; corolla ½ to ¾ in. long.
Sacs barely 1 line deep, longer than deep; infrequent ... 12. *O. hispidus.*
Sacs 1½ lines deep, nearly as deep as long.
Flowers lemon-yellow; divisions of leaves and bracts narrowly linear; common ..... 13. *O. lacerus.*
Flowers white and purplish; divisions of leaves and bracts broader or the leaves entire; rare ..... 14. *O. rubicundulus.*
Bracts with purplish or whitish tips.
Corolla with lower lip conspicuously 3-saccate, the teeth minute or small.
Galea subulate; sacs longer than deep ..... 15. *O. linearilobus.*
Galea truncate at tip; sacs deeper than long ..... 16. *O. gracilis.*
Corolla with lower lip plicate-saccate or moderately 3-saccate, the teeth conspicuous, erect (in O. purpurascens small).
Filaments glabrous; galea nearly straight, pubescent.
Spikes virgate, lax below; flowers dull white; stigma not exserted from galea. 17. *O. attenuatus.*
Spikes stout, often subcapitate, dense; flowers purple and white; stigma exserted from the tip of galea.
Leaves 1 to 2½ in. long, mainly with a pair of lanceolate divisions; stem simple or little branched ..... 18. *O. densiflorus.*
Leaves ½ to 1½ in. long, entire or with linear divisions; stem usually with many ascending branches ..... 19. *O. castilleioides.*
Filaments hairy; galea long, hooked at apex, densely bearded; flowers pinkish purple; stigma exserted from galea below its tip ... 20. *O. purpurascens.*

b. Corolla simply saccate or nearly so.

Bracts herbaceous, somewhat similar to the leaves, palmately 3-lobed, the middle lobe cuneate-lanceolate.
Corolla golden-yellow; lower lip not much broader than the upper ..... 21. *O. luteus.*
Corolla rose-purple; lower lip much broader than the upper ..... 22. *O. bracteosus.*
Bracts colored, strikingly different from the leaves, roundish to elliptic, commonly with a lanceolate tooth on each side.
Bracts mostly dilated above and rounded at the apex; galea incurved at tip ..... 23. *O. tenuifolius.*
Bracts not dilated above, acute at apex; galea straight or nearly so ..... 24. *O. pachystachyus.*

1. **O. cínereus** Jepson n. comb. Stems several from the perennial root-crown, ascending or diffuse, 7 to 9 in. high; herbage cinereous-pubescent; leaves nar-

rowly linear-lanceolate, entire or the upper sometimes divided into 3 linear lobes, erect or somewhat appressed to the stem, 3 to 9 (or 12) lines long, sessile; spikes rather dense, ½ to 2 in. long; bracts (at least the upper) 3-lobed, the lateral lobes narrow, the middle one very broad and very obtuse or truncatish (or spatulate-dilated), yellow, viscid; calyx equally 4-cleft; lower lip almost as long as galea; calyx and corolla yellowish; corolla 5 to 6 lines long; stigma large, conspicuously exserted.—San Bernardino Mts., 6000 to 7200 ft. (Castilleia cinerea Gray.)

2. **O. schizótrichus** Jepson n. comb. Stems many from a perennial root-crown, erect, 3 to 7 in. high; stems whitish-lanate, the leaves and bracts dusky lanate; leaves narrowly linear-lanceolate, acuminate, entire or sometimes 3-divided above, 1 to 1½ in. long; spikes dense; bracts 3-cleft below middle, the outer lobes linear and shorter than the broader lanceolate middle lobes; calyx equally 4-cleft; lower lip of corolla shortly 3-lobed, a little shorter than the galea.—Marble Mt. region, Siskiyou Co. (Castilleia schizotricha Greenm.)

3. **O. pilòsus** Wats. Fig. 880. Stems numerous from the crown of a stout perennial root, leafy, 6 to 8 in. high; herbage soft-villous to hirsute-pubescent; leaves pinnately 3 to 5-parted into linear lobes, or the lower entire; bracts from yellowish or whitish to dull crimson; calyx deeply cleft into linear lobes; flowers white, pink or reddish; lower lip only slightly saccate, strongly 3-toothed, the teeth white; galea purplish, somewhat recurved at tip, a little longer than the lip; stigma very large and black, just exserted from tip of galea.—Montane, 5000 to 10,000 ft.: Sierra Nevada from Tulare Co. to Nevada Co.; n. to Mt. Shasta; Ore. July-Aug. Var. MONÉNSIS Jepson n. var. Somewhat diffuse, 2½ to 3½ in. high; racemes very dense; galea twice as long as the large lower lip.—High montane, 9500 to 10,600 ft., Mono Co.: Mono Pass; Bloody Cañon (Jepson 4431a, type). Var. ARACHNOÌDEUS Jepson n. comb. Stems many from the perennial root-crown, erect, 3 to 7 in. high; herbage and inflorescence thinly arachnoid; leaves 3-lobed, 1 to 1½ in. long, the segments narrowly linear or filiform, entire or the middle one incised or cleft; bracts broad, cleft to below middle; lower lip a little inflated.—Marble Mt., Siskiyou Co. to Salmon Mt., Trinity Co. (Castilleia arachnoidea Greenm.)

880. Orthocarpus pilosus Wats.; *a*, habit x ⅓; *b*, fl. x 1½; *c*, bract x ½; *d*, stamen x 4.

4. **O. pusíllus** Benth. Stem slender and weak, 2 to 4 in. high; herbage purplish, sparingly hispidulous-pubescent; leaves pinnately cleft into linear or filiform divisions; bracts longer than the scattered inconspicuous dark red flowers; corolla 2 to 3 lines long.—Hillsides and fields, 10 to 1500 ft., coloring moist spots with a dull red hue: Santa Clara Co. to Humboldt Co.; n. to Ore. Mar.-Apr. It is often parasitic on grasses.

5. **O. floribúndus** Benth. Stem erect, somewhat corymbosely branched from near the base or the middle, 5 to 12 in. high; herbage nearly glabrous; leaves (especially the upper) pinnately parted into linear-filiform divisions, some again parted; spikes short and dense, the upper bracts not surpassing the calyx; corolla white or cream-color, 6 lines long, its tube much exceeding the calyx; lower lip with 2 hairy lines within.—Hillsides near the coast, 10 to 500 ft.: San Francisco Co. to San Mateo Co.

6. **O. fáucibarbàtus** Gray. Fig. 881. Plants 7 to 20 in. high, commonly with ascending branches from the middle; herbage greenish, glabrous, or puberulent above; leaves oblong or ligulate at base, pinnately cleft above into several linear divisions; spikes at length elongated and lax; bracts shorter than the flowers, palmately cleft or parted into lanceolate segments; corolla sulphur-yellow or pinkish white or white, 9 to 10 lines long, its tube whitish, very slender, pubescent, twice the length of the calyx; sacs of lower lip nearly 2 lines deep, deeper than high; folds of throat bearded within; anthers connivent.—Low moist fields in the Coast Range valleys, 10 to 1500 ft.: Monterey Co. to Del Norte Co. Apr.-May.

881. Orthocarpus faucibarbatus Gray; *a*, fl. branchlet x 1; *b*, leaf x 1; *c*, cross sect. of ovary x 5.

7. **O. erianthus** Benth. JOHNNY-TUCK. Fig. 882. Stem commonly branching, 4 to 10 in. high; herbage, particularly the bracts and stems, reddish; leaves pinnately divided into filiform divisions; spikes slender, flat-topped; bracts much shorter than the flowers; corolla 8 to 9 lines long and sulphur-yellow except the dark purple subulate galea, its filiform tube at least twice the length of the calyx; sacs of the lower lip 2 lines deep, deeper than high, each sac commonly with 2 greenish yellow spots at the base of the tooth; folds of the throat densely bearded; anthers connivent.—Low hills and valleys, 10 to 2000 ft., throughout cismontane Cal.; also sw. Ore. It is very abundant on the plains of the Sacramento and San Joaquin valleys, in the Sierra Nevada foothills and on the low hills of the Coast Ranges, often coloring wide stretches with streamer-like bands of yellow in Apr. and May. Var. MICRÁNTHUS Jepson n. comb. Smaller, about 4 in. high; corolla-tube much shorter; stamens early exserted from galea, the anthers not connivent. — Foothills and plains: Madera Co.; Fresno Co.; w. to eastern Monterey Co. (O. micranthus Greene.) Var. GRATIÒSUS Jepson & Tracy n. var. Two lateral sacs white, the middle one yellow, the galea and throat dark.—Sandhills, Humboldt Co. (Eureka, Tracy 2035, type). Var. VERSÍCOLOR Jepson. Popcorn Beauty. Corolla white, excepting the purple galea, often with a transverse purple band across the throat below the sacs; otherwise like the species.—San Francisco. Var. RÒSEUS Gray. Corolla rose-color. — San Francisco sand hills. Var. INOPÌNUS Jepson n. var. Upper leaves and bracts fan-shaped with linear divisions; sacs of

882. Orthocarpus erianthus Benth.; *a*, habit x ¾; *b*, flower x 1½.

corolla very large, rose-purple with a yellow spot above.—Mendocino (H. E. Brown 700, type).

8. **O. bidwélliae** Gray. Very similar to O. erianthus, but the foliage less pubescent, the corolla tube more slender, 6 to 7 lines long; lower lip rather smaller, golden-yellow, the throat and galea dark purple; seeds with loose cellular arilliform coat.—Foothills, Butte Co. to Placer Co.

9. **O. campéstris** Benth. Stem 2 to 4 in. high, simple or few branched; herbage glabrous below; leaves and bracts narrowly linear, entire or nearly so; spike thickish, dense above; calyx markedly hirsute; corolla white, 6 to 9 lines long, the galea subulate, the sacs ample, very ventricose, 2 lines deep, the teeth scarious, slender, rather conspicuous; capsule ovate.—Fields, Butte and Plumas Cos. to Modoc Co.

10. **O. lithospérmoides** Benth. CREAM SACS. Stem erect and simple, rarely with a few branches above the base, 8 to 12 (or 14) in. high; herbage hirsute-pubescent above, less so below; lower leaves lanceolate, entire; upper oblong, with a few slender lobes; spike very dense and thick; bracts nearly equaling the flowers, the upper large, almost as broad as long, concealing the calyx, dilated at the base, palmatifid into 7 or more narrow lobes; corolla rich cream-color, 9 to 13 lines long, strongly 3-saccate, the tube dilated upwards; capsule ovate.—Plains and low hills, 20 to 1500 ft.: Coast Ranges from Santa Clara Co. to Humboldt Co.; Sacramento Valley and bordering foothills. Var. BICOLOR Jepson n. comb. Flowers white, turning rose-pink.—Butte Co. foothills. (O. bicolor Hel.)

11. **O. làsiorhýnchus** Gray. Stem 3 to 15 in. high, simple or sparingly branched; herbage soft-hirsute; leaves linear-lanceolate, attenuate, entire or 3-parted, ½ to ¾ in. long; spike cylindric, loose, rather few-flowered; bracts 4 or 5-cleft, exceeded by the flowers; corolla yellow, 8 to 10 lines long; galea narrowly subulate, surpassing lower lip, densely white-villous; teeth of the lip very short; capsule 3 lines long; seeds many, with loose reticulated coat.—Montane, 5000 to 6500 ft.: San Bernardino and San Jacinto mountains.

12. **O. híspidus** Benth. Stem simple or sparingly branched, 4 to 12 in. high; herbage soft-hirsute; leaves entire or with few slender divisions, ½ to 1½ in. long; spike lax; bracts palmately cleft into 3 or more lanceolate divisions; calyx 4 to 5½ lines long, the teeth lanceolate; corolla pale yellow (or white), 5 to 8 lines long, the tube filiform; lower lip surpassed by galea, teeth short, sacs longer than deep, throat with dark dots, folds hairy within; capsule ovoid, obtuse, longer than the calyx-tube; seeds obovoid, dark gray.—Montane, 3000 to 5000 ft., infrequent: Palomar Mt.; both slopes Sierra Nevada from Tulare Co. to Modoc and Siskiyou Cos.; n. to B. C. June.

883. Orthocarpus lacerus Benth.; *a*, habit x ½; *b*, fl. x 1½; *c*, calyx spread open x 1½; *d*, stamen x 3½.

13. **O. lácerus** Benth. Fig. 883. Stem 3 to 8 in. high, erect, simple or sparingly branched; herbage soft-hirsute, viscid above; leaves ½ to 1½ in. long, alternate or the lowest opposite, linear-lanceolate, entire or pinnately 3-parted; spike loose, cylindric, few to many-flowered; bracts palmately 3 to 7-cleft into narrow divisions; calyx 3 lines long, cleft into lanceolate divisions; corolla bright or lemon yellow, 6 to 8 lines long, the lip 1½ lines deep, 2 lines long; galea gla-

brous or puberulent on back; lower lip often dark-dotted; teeth short, surpassed by galea; capsule 3 lines high.—Foothills and middle altitudes, 700 to 4700 ft., common: Sierra Nevada from Tuolumne Co. to Modoc Co. May-July.

14. **O. rubicúndulus** Jepson n. sp. Stem simple or branched above, 4 to 9 in. high, pilose; leaves lanceolate, entire or 3-cleft, hispid, 1 in. long; inflorescence dense above, lax below; bracts all green, 7 to 9 lines long, broad at base, 3 to 5-cleft into lanceolate divisions, hispid or somewhat pilose; calyx 4 lines long, cleft for nearly half its length into subulate segments; corolla white, turning a light rosy-pink, 9 lines long; sacs conspicuous, 2 lines deep, as deep as high, each sac with a deep longitudinal crease so deep as to make each one almost 2 distinct sacs; main folds of the sacs inside very hairy-pubescent; 2 yellow spots at base of saccate lower lip; teeth very short (the apices of the sacs rising above them), with greenish-yellow spots on the inside at apex, surpassed by the straight subulate galea.—Inner North Coast Range montane valleys from Lake Co. (Indian Valley, Jepson 9001, type) to ne. Napa Co. May.

15. **O. línearílobus** Benth. Stem 6 to 9 in. high, simple or branched; herbage hirsute or nearly hispid; leaves alternate, 1 to 2 in. long, lanceolate, entire or pinnately parted into long slender divisions; spike dense; bracts nearly equaling the flowers, the long slender divisions sometimes purplish-tipped; calyx-lobes much longer than the tube; corolla 7 to 9 lines long, white or yellowish-white, commonly with a few purple dots on the sacs; galea exceeding lower lip, teeth short, sacs deeper at upper part, narrowing gradually downward; capsule 4 lines long; seeds many, with loose reticulated coat.—Sierra Nevada foothills, Yuba Co. to Mariposa Co. Apr.-May.

16. **O. grácilis** Benth. Stem 4 to 10 in. high, simple or branched from the base; herbage glabrous below, minutely pubescent above; leaves mostly 3-parted, linear-filiform; spike rather dense, slender; upper bracts shorter than the flowers, purplish-tinged at tip; corolla scantily puberulent, purplish, 6 to 7 lines long; tube slender, twice the length of the calyx; galea little exceeding the purple teeth of the lower lip, truncate at tip; sacs white, changing to purple, deeper than long, somewhat conical; lower anther-cell mostly imperfect; capsule oblong, obtuse.—Santa Lucia Mts. to San Diego Co.

17. **O. áttenuàtus** Gray. Valley Tassels. Stem slender, strict or more rarely with a few branches, 5 to 12 in. high; herbage hirsute-pubescent; leaves linear-lanceolate, attenuate, entire or the upper with one or more filiform lobes above the middle, 1 to 3 in. long or less, mostly 1, or sometimes 5, lines wide; spikes slender, loose below, denser above; bracts with white tips or almost wholly herbaceous; calyx-lobes 4, filiform, the divisions of nearly equal depth; corolla dull white, sometimes yellow, not deeply 2-lipped; lower lip shallowly saccate, purple-dotted, its lanceolate teeth large for the size of the corolla, almost as long as the saccate portion and nearly or quite equaling the galea; capsule oblong, about 3 lines long; seeds white.—Valleys and foothills, 10 to 2100 ft.: Coast Ranges from Santa Barbara Co. to Siskiyou Co.; Tehachapi Mts.; Sacramento Valley; Sierra Nevada foothills from Tuolumne Co. to Butte Co. May.

18. **O. densiflòrus** Benth. Owl's Clover. Stem strict or strictly branched, 5 to 15 in. high, finely pubescent; leaves oblong-lanceolate to linear, 1 to 2½ in. long, with mainly a pair of filiform or slender divisions; spike dense, 4 in. long or less; bracts 3-cleft with purple and white tips; calyx-segments spatulate-dilated, purple; corolla 8 to 10 lines long, purple and white; lower lip with large crimson dots, the conspicuous purple (sometimes white) teeth nearly as long as the rather short galea.—Valley fields and low hills, 20 to 2500 ft., common: Coast Ranges from Mendocino and Solano Cos. to San Luis Obispo Co. and s. to San Diego Co.; Mariposa Co. foothills. Apr.-June.

19. **O. castilleioìdes** Benth. Johnny-Nip. Stem corymbosely branched from the base, commonly 6 to 11 in. high; herbage somewhat hirsute-pubescent; leaves shorter and mostly broader than in O. densiflorus, mostly 1 to 4 lines wide, entire or with laciniate linear divisions; spikes short and dense, or even subcapitate, the bracts with white or yellowish tips; calyx-segments linear; corolla 6 to 10 lines long, dull white with purple marks or the sacs

884. Orthocarpus purpurascens Benth.; *a*, infl. x ¾; *b*, fl. with calyx removed x 1; *c*, capsule x 1.

yellow; galea scarcely longer than the bright rose purple teeth; capsule oblong, 5 to 6 lines long, obtuse or emarginate; seeds oblong or longer, dark brown.—Marshy ground near the coast, 10 to 200 ft.: Monterey Co. to Napa and Humboldt Cos.; n. to Wash. June. Var. ÍNSALUTÀTUS Jepson n. var. Leaves and bracts broader and shorter; bracts mostly 3-parted, the middle lobe broad and very blunt; sacs of lower corolla-lip broad and very protuberant.—Monterey Co. (Pacific Grove, Jepson, type).

20. **O. purpuráscens** Benth. ESCOBITA. Fig. 884. Stem erect or frequently much branched from the base with ascending branches, 4 to 15 in. high; herbage villous-pubescent; leaves parted into many linear or filiform divisions, which are often brownish-tinged; spike thick and dense, 2 to 4 in. long; bracts dilated at base, palmately cleft into filiform or narrowly linear lobes, the upper with crimson or purple spatulate-dilated tips, as also the calyx-lobes; calyx more deeply cleft behind than before; corolla crimson or purplish, ¾ to 1¼ in. long; lower lip white-tipped, with yellow and purple dots or markings; galea densely purple-bearded on the back, incurved at tip, exceeding the lower lip; capsule ovate, acute, 5 to 6 lines long; seeds orbicular to ovate, white, somewhat winged.—Valleys and low hills, common, 10 to 2000 (or 5000) ft.: cismontane S. Cal.; Monterey Co. to Napa Co.; lower San Joaquin Valley; Sacramento Valley; n. Sierra Nevada foothills from Tuolumne Co. to Nevada Co. Apr.-May. Var. MULTICÁULIS Jepson n. var. Stems several from the base, ascending, 4 to 5 in. high; lobes of the bracts very short and broad.—Ft. Bragg (W. C. Mathews, type). Var. ORNÀTUS Jepson n. comb. Three to 4 in. high; purple ends to bracts showy; tips of sacs deep yellow.—Central Mohave Desert. (O. ornatus Hel.)

21. **O. lùteus** Nutt. Stem 3 to 11 in. high, simple or above sparsely branched; herbage more or less hispid, glandular-pubescent; leaves ½ to 1 in. long, linear-lanceolate, entire, or the upper 3-parted; spike elongate, dense, becoming lax below; bracts 3½ to 4 lines long, wholly herbaceous, 3-parted, the lobes lanceolate, acute; calyx 2 to 2½ lines long, the teeth acute or obtusish; corolla 4 to 4½ lines long, well-exserted, golden-yellow, pubescent, the tube exserted from the calyx, the galea uncinate, equaled by the lower lip, this not constricted below the teeth which are merely incurved; anthers 2-celled, the cells bearded.—East slope Sierra Nevada from Mono Co. to Modoc Co.; n. to B. C., e. to Col. Aug.-Sept.

22. **O. bracteòsus** Benth. Stem 3 to 18 in. high, strict, simple or branched; herbage somewhat hirsute, glandular-pubescent; leaves ½ to 2 in. long, lanceolate, entire or 3-lobed, the lobes acute; spike cylindric, dense or becoming lax below; bracts 4 to 6 lines long, shorter than the flowers, 3-lobed, the lobes lanceolate, acute; calyx 2½ to 3 lines long, the 4 lanceolate teeth ½ as long as the tube; corolla narrow-funnelform, rose-purple, 6 to 7 lines long; galea hooked at apex, hardly longer than the much-dilated 3-saccate lower lip; anthers 2-celled, the cells ciliate; capsule ovoid, 2 to 3 lines long; seeds costate.—Modoc Co.; n. to B. C.

23. **O. ténuifòlius** Torr. Stem 5 to 13 in. high, somewhat pubescent or hirsute, branched above; leaves lanceolate, entire or with narrow lateral lobes, ½ to 1¼ in. long; spike dense, cylindric; bracts 5 to 6 lines long,

quadratish-elliptic, entire, or with a short narrow lateral lobe on each side, rounded at apex or sometimes sharply acute; calyx deeply cleft, the lobes shallowly 2-cleft; corolla purplish, often with yellow sacs, puberulent, ½ in. long, the tube much longer than the calyx; galea incurved at tip, surpassing the 3 inconspicuous teeth; anther-cells oblong, sparsely pubescent.—Humboldt, Trinity and Shasta Cos.; n. to B. C. July-Aug.

24. **O. pachýstachyus** Gray. Stem 6 to 11 in. high, slightly hirsute, simple or somewhat branched above; leaves linear-lanceolate, entire or 3-parted into lanceolate divisions; bracts imbricated in the thick spike, elliptic to ovate, abruptly acute, entire or with a lanceolate lobe on each side toward the base, 7 to 8 lines long, more or less hispid-ciliate toward the base, the tips purplish; calyx 4½ lines long, hispid, deeply 2-cleft, its lobes cleft to the middle into subulate divisions; corolla glandular-pubescent, 1 in. long, dark purple with yellowish sacs, the long galea nearly straight, greatly exceeding the lower lip, the teeth conspicuous.—Siskiyou Co. June. Var. CUSPIDÀTUS Jepson n. comb. Bracts smaller; corolla 5 to 6 lines long, the short blunt galea but little longer than the lower lip.—Montane, 5000 to 7000 ft.: Sierra Nevada from Mariposa Co. to Siskiyou Co.; n. to Ore. (O. cuspidatus Greene.)

23. **CORDYLÁNTHUS** Nutt. BIRD'S BEAK

Branching annuals. Leaves alternate, narrow, either entire, pinnatifid or 3 to 5-parted into linear divisions. Bracts and calyx seldom colored. Flowers scattered along the branches or in terminal clusters or heads. Calyx spathe-like. Corolla tubular, enlarged a little upwards, 2-lipped, the lips of nearly equal length; upper lip incurved at apex, hooding the stamens and pistil; lower lip entire or obtusely 3-toothed. Stamens 4 or 2; anthers 2 or 4-celled, the cells unequal, ciliate or minutely bearded. Capsule flattened; seeds with a loose coat. (Greek cordule, club, and anthos, flower, in reference to the shape of the corolla.) ADENOSTEGIA.

Bracts and floral leaves (at least some of them) gland-tipped; flower scattered or borne in terminal heads; filaments villous (except in C. capitatus).—Subgenus ADENOSTEGIA.
- Stamens 2; filaments nearly glabrous; anthers 1-celled.....1. *C. capitatus.*
- Stamens 4; filaments villous; anthers 2-celled (1-celled in no. 6).
  - Flowers in dense terminal heads, these few to many-flowered (some of the flowers scattered in var. of no. 2).
    - Heads of many flowers; bracts more or less hirsute-ciliate, all except the uppermost 3-parted into linear divisions.....2. *C. rigidus.*
    - Heads of few flowers; bracts not hirsute-ciliate, all except the uppermost fan-shaped, obtusely 3 to 5-lobed.....3. *C. pringlei.*
  - Flowers more or less scattered along the stems, these terminated by single flowers or by loose clusters of 2 to 5.
    - Lower bracts 5 to 7-parted into long narrowly linear divisions..4. *C. ramosus.*
    - Lower bracts entire or 3-toothed or -parted.
      - Anthers 2-celled; corolla equaled or exceeded by at least some of the lower bracts, these entire, 3-toothed or -parted...5. *C. pilosus.*
      - Anthers 1-celled; corolla usually far exceeding the 3-parted lower bracts. 6. *C. nevinii.*

Bracts and floral leaves not gland-tipped; flowers borne in dense spikes; filaments glabrous. —Subgenus HEMISTEGIA.
- Some of the leaves pinnatifid; stamens 2; anthers 2-celled.....7. *C. mollis.*
- Leaves entire; stamens 4, the anthers of the longer 2-celled, of the shorter 1-celled... 8. *C. maritimus.*

1. **C. capitàtus** Nutt. Stem 7 to 12 in. high, more or less branched; herbage pubescent with long soft white hairs, somewhat glandular; leaves 3 to 12 lines long, linear, entire or 3-parted; flowers in small heads, or some scattered; lower bracts linear, entire or 3-parted; uppermost bract entire, 5-nerved, purplish, acute, curving outward; calyx cleft to base anteriorly, 2-nerved, 2-cleft at apex posteriorly, shorter than corolla; corolla 6 lines long, purplish, lips nearly equal, the lower entire, rounded; stamens 2, the filaments nearly glabrous, dilated above base and forming a U-shaped curve toward the apex; anthers 1-celled, ciliate.—Lassen Co.; n. to Wash. and Ida.

2. **C. rígidus** (Benth.) Jepson. MULE-WEED. Stem erect, paniculately branched, 1 to 2 or 3 ft. high; herbage finely puberulent, sometimes hispid or glabrous below; lower leaves linear, entire, upper 3 to 5-parted into linear divisions, their tips dilated and retuse; flowers crowded in terminal heads,

the uppermost bract entire, the others 3-parted into linear divisions with dilated tips, these (together with the calyx) hispid-ciliate, sometimes purplish or purple-dotted; calyx obliquely parted on the anterior side nearly to base; corolla dull white or yellowish and purplish, 7 lines long, often densely pubescent within, the upper lip slightly longer than the lower; filaments villous on lower side; anther-cells ciliate.—Hills and cañons, 500 to 3000 (or 6500) ft.: cismontane S. Cal.; n. to the Santa Cruz Mts. and Mt. Hamilton Range. Var. SYLVÁTICUS Jepson n. var. Puberulent; leaves and bracts more broadly linear, entire or less deeply 2-parted, the upper ones from hispid-ciliate to minutely ciliate; heads large.—Near the coast from Santa Lucia Mts. (Cold Spr., Jepson 2590, type) to Santa Barbara Co.; mts. of Tulare Co. Var. LITTORÀLIS Jepson n. comb. About 1 ft. high, diffusely much-branched; herbage puberulent; leaves entire or 3-parted, ¾ in. long; bracts 3-parted into linear divisions, not hispid-ciliate; flowers mostly in small terminal heads, some scattered.—Monterey Co. (A. littoralis Ferris.) Var. BREVIBRÁCTEÀTUS (Gray) Mcbr. Herbage glabrous or puberulent below inflorescence; bracts hispid-ciliate with short bristles, also shorter and fewer; heads small, the flowers shorter and fewer.—Tulare and Kern Cos. (C. filifolius var. brevibracteatus Gray.)

3. **C. prínglei** Gray. About 1¼ ft. high, diffusely branched, glabrous or puberulent below, the inflorescence finely pubescent; leaves linear-filiform, 4 to 6 lines long; lower bracts fanshaped, obtusely 3 to 5-lobed, the uppermost bract and the calyx oblong, bifid, equaling the corolla, the 4 or 5 nerves closely beset with wart-like glandular protuberances; flowers in capitate clusters of 3 to 5, terminating the stem and branches; corolla 4 to 5 lines long, about equaling the calyx.—Montane summits, Lake Co., very local: Cobb Mt.; Snow Mt.

4. **C. ramòsus** Nutt. Stem 5 to 10 in. high, much-branched; herbage pubescent, the apical glands obscure; leaves 1 to 1½ in. long, mostly 3 to 7-parted into filiform divisions; some of the flowers scattered, most of them in loose terminal clusters of 3 to 5; bracts mostly longer than the flowers, rather sparsely hispid and hispid-ciliate, all except the uppermost 5 to 7-parted for more than ¾ their length into linear divisions, the tips not dilated; calyx cleft to base anteriorly, bidentate at tip, longer than the corolla; filaments villous, anther-cells ciliate.—Lassen Co.; n. to Ore., e. to Rocky Mts. July.

5. **C. pilòsus** Gray. Stem paniculately branched, 2 to 3 ft. high, pilose or soft-pubescent; leaves linear, somewhat fascicled below, ¼ to 1 in. long, the upper and floral often with 1 to 3 callous-glandular teeth at the broadly dilated tip or sometimes 3-parted into linear divisions; flowers 2 or 3 together at the ends of the branchlets, or only 1; calyx equaling or exceeding the corolla, often sharply bifid at apex, anteriorly cleft to base; corolla 6 to 8 lines long, yellowish or purplish, the lower lip rather broad below, shorter than the upper; stamens 4; anthers 2-celled, free, the cells often ciliate; filaments villous.—Dry hills, 50 to 2000 (or 5200) ft.: Coast Ranges from Colusa and Sonoma Cos. to Santa Clara Co.; s. to Ventura Co. Sept. Var. TRÍFIDUS Rob. & Greenm. Slender, ½ to 2 ft. high, branching; herbage white-pilose, more or less glandular; leaves ¼ to 1 in. long, the larger linear, entire, the smaller and the bracts commonly pinnately divided near the base into 3 divisions, the lateral divisions much shorter than the middle one; bracts dilated and notched at the tips.—Mariposa Co. Var. BOLÁNDERI Gray. Commonly lower, less pilose, more viscid and glandular; flowers all scattered, the bracts often 3-parted into linear divisions with dilated tips.—Napa Co. to Siskiyou Co., thence to Modoc and Amador Cos. Var. TÉNUIS Jepson n. comb. One to 2 ft. high, more slender, seldom pilose or glandular; leaves narrower, entire, scarcely or not at all dilated at tips; bracts entire, sometimes 3-parted, the tips slightly or not at all dilated.—Sierra Nevada from Fresno Co. to Lassen Peak; n. Lake Co. (C. tenuis Gray.) Var. BRÙNNEUS Jepson n. var. About 1¼ ft. high, glabrous below, diffusely and subdivaricately branched, branches very slender and wiry, dark brown or mahogany-color; leaves filiform, 6 lines long, the floral somewhat callous-tipped; branchlets and inflorescence sparsely and minutely glandular-hispid; flowers few, solitary, terminating the stem and branches; calyx narrow, bifid; corolla white or greenish-

white, marked with purple at the middle, 4 to 5 lines long; capsule oblique at summit, beaked.—Montane summits, Napa and Lake Cos.: Howell Mt.; Mt. St. Helena (Jepson, type); Mt. Hanna.

6. **C. nevínii** Gray. Stem loosely much-branched, ½ to 2 ft. high; herbage villous-pubescent, glandular; leaves linear, entire or 3-parted, the tips often glandular-dilated and toothed; flowers scattered along the slender branchlets or 1 to 3 at the apices, usually much exceeding the subtending bracts; lower bracts linear, mostly 3-parted, the tips dilated, glandular, often whitish; uppermost bract sheathing at base, rounded at apex, short-bristly or somewhat muriculate-scabrous; calyx tubular at base or obliquely cleft or parted on the anterior side nearly to base, soft-ciliate, glandular-bristly or somewhat muriculate-scabrous; corolla yellowish or purplish, 5 to 9 lines long, tubular at base, becoming broadly expanded above the middle, narrowing abruptly to a point at the tip, the lips about 2 lines long, nearly equal; stamens 4, borne on a densely pilose yoke-shaped ridge which separates the tube anteriorly from the expanded portion of the corolla, the filaments villous; anthers free or connivent in pairs, 1-celled, the cell ciliate, the second cell sometimes rudimentary; seeds nearly smooth, scarious-apiculate.—Montane, 6000 to 7000 ft.: San Gabriel, San Bernardino and San Jacinto mountains; s. to Cuyamaca Mts. Aug.-Sept.

7. **C. móllis** Gray. Simple or branched, ½ to 1 ft. high, villous-pubescent, the bracts densely villous-hirsute; leaves 4 to 8 lines long, linear or oblong, entire, or the upper leaves and the bracts saliently few-toothed or pinnatifid; flowers borne in thick spikes 1½ to 3½ in. long; calyx anteriorly cleft entirely to base; corolla 8 to 9 lines long, the tube gibbous at base, widening upward, the lips 2½ lines long, the lower deeply 3-crenate, the upper incurved; stamens 2; anthers 2-celled, connivent; filaments glabrous; anther-cells hairy at base; style long, hooked at apex, exserted; seeds reniform, reticulate-favose.—Salt marshes bordering San Francisco Bay and its arms. Aug.

8. **C. marítimus** Nutt. Corymbosely branched, 5 to 12 in. high; herbage glaucous and more or less hoary-pubescent; leaves linear or lanceolate to oblong, 1 in. long, entire; flowers in short rather thick spikes, about as long as the loosely imbricated entire or unequally 2 or 3-cleft bracts; calyx sheath-like, cleft to the base anteriorly, entire or notched at apex; corolla purplish, pubescent without, 2-lipped at summit, the lips about equal, the lower lip deeply 3-crenate, the upper incurved at apex, the tube narrow; stamens 4 in very unequal pairs; anthers of the longer pair connivent, 2-celled, of the shorter pair free with only the lower small cell, the other cell usually represented by a filamentous or somewhat flattened process, all the cells hairy at the base; filaments glabrous or the shorter pair somewhat pubescent; style hooked at apex. exserted; seeds reticulate-favose.—Salt marshes or saline meadows: cismontane S. Cal. and n. along the coast to Humboldt Co. July. Var. CANÉSCENS Jepson n. comb. Canescent with soft villous pubescence; corolla white.—E. side Sierra Nevada: Owens Lake; Modoc Co. (C. canescens Gray.) Var. PÁRRYI Jepson n. comb. A taller more branching form with the upper leaves and bracts narrower, lanceolate, entire.—Honey Lake Valley. (C. parryi Wats.)

24. **BELLÁRDIA** All.

Erect finely pubescent annual with opposite leaves. Flowers in a dense terminal spike, solitary and sessile in the axils of broad imbricated bracts. Calyx campanulate, deeply cleft before and behind into 2 shortly notched lobes. Corolla strongly 2-lipped, the upper lip galeate, a little shorter than the lower; lower lip very broad, shallowly 3-lobed, the palate with 2 narrowly-inflated longitudinal folds. Stamens 4, with broad filaments, the lower pair slightly longer; anthers densely short-hairy near the margins of the valves. Ovary white-hairy. Capsule turgid. (C. A. L. Bellardi, 1740-1826, Professor of Botany in Turin University.)

1. **B. trixàgo** (L.) All. Stems ½ to 1½ ft. high, retrorsely pubescent; leaves lanceolate or linear-lanceolate, coarsely toothed; spike dense, thick, somewhat 4-sided; bracts ovate-cordate, attenuate; corolla white, or the

galea pink, 8 to 9 lines long, the calyx half as long.—Nat. from Eur. in old fields: Pacheco; East Oakland; Berkeley; Napa. May.

25. **PARENTUCÉLLIA** Viv.

Erect annual herbs with toothed leaves. Flowers in a terminal leafy spike. Calyx campanulate, deeply 4-cleft, the front and back sinuses a little deeper than the lateral. Corolla 2-lipped, the upper helmet-shaped, the lower 3-lobed. Stamens 4. Anther-cells approximate, mucronate at base. Capsule lanceolate, loculicidal. (Meaning obscure.)

1. **P. viscòsa** (L.) Car. Stem slender, simple or somewhat branching, ¾ to 2 ft. high; leaves oblong-lanceolate, sessile, ¾ to 1½ in. long; corolla yellow, 8 to 9 lines long.—Native of s. Eur., introduced in valley lands from Arcata to Blue Lake, Humboldt Co.

26. **PÉDICULÀRIS** L. Lousewort

Perennial herbs. Leaves alternate or basal, pinnatifid or pinnate (or simple in P. racemosa). Flowers in a bracteate raceme or spike. Calyx 2 to 5-cleft or -toothed. Corolla strongly 2-lipped; upper lip galeate, strongly arched; lower lip of 3 small rounded lobes or teeth, the middle lobe the smallest. Stamens 4, under the galea; anthers with equal cells. Capsule flattened, oblique at apex, loculicidally 2-valved. (Latin pediculus, a louse; of uncertain application.)

Calyx split to the base in front, 2-toothed behind; galea beaked; stems branching; leaves not divided, merely crenulate.....1. *P. racemosa.*
Calyx 5-cleft or -toothed; stems strictly simple, usually several from the root-crown; leaves pinnatifid or pinnate.
  Stems without basal leaves; galea shortly beaked.....2. *P. howellii.*
  Stems always with a basal tuft of leaves.
    Upper lip of corolla blunt and beakless; raceme or spike little surpassing or shorter than the simple leaves.
      Corolla red; flowers in a raceme raised on a stem.....3. *P. densiflora.*
      Corolla yellow; flowers in a spike (or spike-like raceme) on the ground.....4. *P. semibarbata.*
    Upper lip of corolla produced above the galea into a slender curving proboscis-like beak; flowers in a spike, much exceeding the leaves, these chiefly in a short basal tuft.
      Calyx-teeth ½ to as long as the tube; beak closely recurved on the galea; spike woolly.....5. *P. attollens.*
      Calyx-teeth very short; beak curving forward beyond the galea and then upward; spike glabrous.....6. *P. groenlandica.*

1. **P. racemòsa** Dougl. Stems 8 to 20 in. high, many from a woody root-crown, with very slender branches; herbage glabrous; leaves lanceolate, narrowed at base into a petiole, minutely and doubly crenulate, 1¼ to 3½ in. long; flowers on short pedicels, in a leafy-bracteate loose raceme; calyx split to the base in front, 2-toothed behind, 3 lines long; corolla pink or white, 7 to 9 lines long; lower lip 6 lines broad, twice as broad as long; upper lip strongly incurving and prolonged into a tapering hooked beak which nearly touches the lower lip; anthers sagittate.—Montane, 6000 to 7000 ft.: Placer Co. to Trinity and Siskiyou Cos.; n. to B. C., e. to Rocky Mts.

2. **P. howéllii** Gray. Stems 12 in. high, simple, several from the scaly buds of the root-crown, naked below, leafy above, ending in a dense short-cylindric spike 1 in. long; herbage glabrous; leaves pinnate with 5 (or 3) serrate leaflets, the lateral oblong-ovate, 8 to 9 lines long, the terminal leaflets much larger; uppermost leaves simple; bracts entire or obscurely lobed, villous on lower half, shorter than the flowers; calyx villous, its lobes very short, mostly toothed; corolla white, 4 lines long, strongly arched, with a short recurved beak; lobes of the lower lip very small, equal, denticulate; filaments glabrous.—Dry ridges, Siskiyou Mts., 6000 ft.

3. **P. densiflòra** Benth. Indian Warrior. Fig. 885. Stems simple, erect, 9 to 12 in. high, commonly several from the scaly root-crown; herbage soft-pubescent or nearly glabrous; leaves pinnately divided or parted, the segments oblong and doubly serrate-toothed or incised; flowers in a dense raceme; bracts linear, ciliate or serrulate towards the apex, mostly shorter

than the flowers, crimson or crimson-tipped; calyx-teeth broadly lanceolate, 1½ to 2 lines long, half as long as the tube; corolla crimson, bent downward above the calyx, 10 to 12 lines long; galea large, slightly broader upwards, strongly arched; lower lip very small, of 3 rounded teeth; anther-cells acute at base.—Wooded hills: Coast Ranges from Humboldt Co. to Santa Clara Co., s. to the San Gabriel and San Bernardino mountains.

4. **P. semibarbàta** Gray. Stems few, short and mostly subterranean, arising from the root-crown and bearing on the ground a few short spikes (or spicate racemes) surrounded by a rosette of leaves; leaves twice pinnatifid, 2 to 6 in. long, their petioles equaling or exceeding the spikes; corolla yellowish, purplish-tinted, 9 to 10 lines long; upper lip rounded, little longer than the lower lip; lower filaments villous above the middle, the upper pair only slightly so.—Mountain forests, 5000 to 7200 ft.: Sierra Nevada from Nevada Co. to Tulare Co.; Mt. Pinos; San Gabriel, San Bernardino and Santa Rosa mountains.

885. Pedicularis densiflora Benth.; *a*, habit x ¼; *b*, fl. x 1; *c*, lower lip of corolla x 2.

5. **P. attóllens** Gray. ELEPHANT SNOUTS. Fig. 886. Stems simple, 6 to 13 in. high, one or several from a cluster of slender-fusiform roots; herbage glabrous or somewhat woolly above; leaves mostly in a basal cluster (the cauline few and more or less reduced), pinnately divided with toothed segments; corolla white or pink with purplish markings; upper lip strongly saccate-galeate, the sac produced into an abruptly and rather closely upturned slender proboscis, this 2 to 3 lines long; middle lobe of lower lip very small, half the size of the lateral.—Wet meadows, 8900 to 12,000 ft.; Sierra Nevada; White Mts.; San Bernardino Mts.

886. Pedicularis attollens Gray; *a*, fl. stem x ⅔; *b*, leaf x ⅔; *c*, fl. x 1⅓.

6. **P. groenlándica** Retz. ELEPHANT HEADS. Stems 6 to 14 (or 25) in. high; corolla crimson; herbage glabrous; upper lip galeate, produced into a long beak at first bent downward but soon curving forward and upward; galea more or less covering the middle lobe of lower lip, its beak 4 to 5 lines long, much longer than the lower lip; lower lip with 3 short roundish lobes.—Wet meadows, 7500 to 10,600 ft.: Sierra Nevada from Fresno Co. to Tehama Co.; Humboldt Co. to Siskiyou Co.; n. to B. C., thence e. to Lab.

BIGNONIÀCEAE. BIGNONIA FAMILY

Trees or shrubs. Corolla large and showy, usually 2-lipped. Stamens 4, in 2 sets. Style 1, stigmas 2. Fruit a large woody 2-valved capsule resembling a silique, the valves separating from the broad partition which bears the large winged seeds. Ovary superior, in ours 2-celled.

1. CHILÓPSIS G. Don

Leaves simple, linear. Flowers in a terminal raceme. Corolla funnelform, bilabiately 5-lobed, the lobes broad, spreading, erose. Stamens 4; also a fifth as a rudiment. Capsule long-linear, terete. Seeds with the wing at each end dissected into long hairs. Seeds long-hairy. (Greek cheilos, lip, and opsis, resemblance.)

1. **C. linearis** DC. DESERT WILLOW. Stems 2 to 10 in. in diameter, few to many from a common base, sprawling, ascending or erect, forming a broad crown (8 to 25 ft. high) resting on the ground; leaves alternate or the lower opposite or whorled, linear or linear-lanceolate, falcately curving, 3½ to 6 in. long; calyx inflated, usually deeply 2-lipped, the upper lip minutely 3-toothed, the lower 2-toothed; corolla pink, 1½ in. long, its long throat curving horizontally from the short tube; pods 4 to 8 in. long.—Sandy washes or near springs, mostly in the deserts, 10 to 2000 ft.: e. Mohave Desert; Colorado Desert; San Jacinto Valley; Redlands; e. to Tex., s. to Mex. Apr.-May.

MARTYNIACEAE. MARTYNIA FAMILY

Herbs with trailing or ascending stems. Leaves simple, chiefly opposite. Flowers perfect, irregular, ours in racemes. Calyx 4 to 5-cleft or -parted, sometimes split to the base on the lower side. Corolla 2-lipped, the 2 lobes in upper lip and 3 lobes in lower lip nearly equal. Stamens 4, 2 long and 2 short, perfect, or the upper pair sterile. Ovary superior, in ours 1-celled with 2 parietal placentae, each expanded into 2 broad intruded plates. Style slender; stigma 2-lobed, very sensitive. Seeds flattened; endosperm none.

1. MARTÝNIA L. UNICORN PLANT

Calyx-lobes mostly unequal. Corolla gibbous, funnelform-campanulate. Capsule 4-celled by the extension of the placentae, curved, beaked, loculicidally 2-valved, the outer part fleshy, the inner part woody-fibrous, crested below or also above; beak longer than the body, splitting into 2 elastically diverging curving spines. (John Martyn, 1693-1768, Professor of Botany in Cambridge University.)

Pod with the endocarp crested on the upper (posterior) side.....1. *M. proboscidea.*
Pod with the endocarp crested on both sides.....2. *M. althaeafolia.*

1. **M. proboscidea** Glox. UNICORN PLANT. Annual, roughish puberulent; leaves roundish cordate, shallowly lobed or nearly entire, 1¼ to 4 or more in. broad; corolla deep yellowish or reddish, 1¼ to 1¾ in. long; body of fruit 3 or 4 in. long, the long curving claw about twice as long.—Mexican species, an escape or possibly naturalized in a few places: Keene, Kern Co.; Meinert, Ignacio Valley; Sacramento Valley. Also called Devil's Claw.

M. FRAGRANS Lindl. Perennial, less stout; leaves roundish to oblong-cordate, 1 to 2 in. broad; corolla nearly campanulate, 1 to 1¾ in. long and as broad, reddish purple.—Mexico; apparently also at Agua Caliente, Colorado Desert.

2. **M. althaeafolia** Benth. Small low perennial, the stems 6 to 10 in. long; leaves roundish-cordate or -ovate, sinuately 3 to 7-lobed, ¾ to 3 in. broad; corolla yellowish or brownish, 1 to 1½ in. long.—Colorado Desert: Chocolate Mts. (Milpitas); Vallecito.

LENTIBULARIACEAE. BLADDERWORT FAMILY

Ours aquatic insectivorous plants. Calyx 2-lipped. Corolla deeply 2-lipped, the lower lip larger, 3-lobed, spurred at the base. Stamens 2, anterior. Ovary superior, 1-celled, with a free central placenta bearing several ovules. Fruit a 2-valved capsule. Seed with a straight embryo and no endosperm.

1. UTRICULARIA L. BLADDERWORT

Leaves capillary-divided and bearing little bladders which possess a kind of valve-like opening. Scapes with minute auricled scales, 1 to several-flowered. Flowers (in ours) yellow. Calyx-lips entire. Corolla with a projecting palate on the lower lip, often closing the throat; upper lip erect.—The bladders are provided with a valve opening inward, so that small aquatic animals

having entered are unable to escape. (Latin utriculus, a little skin or leathern bottle.)

Pedicels recurved in fruit; scapes 5 to 12-flowered; leaves with bladders.
Spur nearly as long as the lower lip; bladders numerous.....1. *U. vulgaris.*
Spur very short or almost none; bladders few.....2. *U. minor.*
Pedicels erect in fruit; scapes 1 to 4-flowered; bladders few, on short root-like branches, not on the leaves .....3. *U. intermedia.*

1. **U. vulgàris** L. COMMON BLADDERWORT. Immersed stems 1 to 2½ ft. long, sparingly branched; leaves bi- or tri-pinnately divided, 7 to 10 lines long, bearing many bladders; scapes 5 to 15-flowered; corolla closed, 6 to 9 lines broad, the lower lip a little longer than the upper; spur conical, upwardly curved, somewhat shorter than the lower lip.—Widely distributed in Cal. but rather infrequent: Bear Valley, San Bernardino Mts.; Kern River; Bouldin Isl.; Olema; Santa Rosa; Tuolumne Mdws.; Lake Tahoe; Honey Lake; Alturas; n. to Alas.; Eur., Asia.

2. **U. minor** L. LESSER BLADDERWORT. Stems creeping on the bottom in shallow water; leaves with few divisions, bearing 1 to 5 bladders each; some larger leaves sometimes with flat segments and without bladders; scape 3 to 6 (or 8)-flowered; upper lip of corolla minute (1 to 2 lines long), the lower twice as long; spur short, saccate.—Rare in Cal.: Plumas Co.; n. to Alas., thence circumpolar.

3. **U. intermèdia** Hayne. Stems creeping on the bottom in shallow water, giving rise at one end to the erect scapes; leaves without bladders, very much crowded on the stems, 2-ranked, 2 to 3 times divided, 2 to 3 lines long, the linear-subulate divisions microscopically bristle-toothed; bladders large, borne on separate leafless branches; scape 1 to 4-flowered; upper lip of corolla 2½ to 3 lines long, half as long as the lower (which is 7 to 8 lines broad), the conical-subulate spur about ¾ as long as the lower lip.—Mountain swamps, 4500 to 5000 ft., rare in Cal.: Plumas Co.; n. to B. C., e. to Newf.; Eur., Asia.

OROBANCHÀCEAE. BROOM-RAPE FAMILY

Root-parasitic herbs, destitute of green color, with alternate scales in place of leaves. Flowers complete. Calyx persistent. Corolla tubular, more or less 2-lipped, the upper lip 2-lobed or entire, the lower 3-lobed. Stamens 4, didynamous, inserted on the tube of the corolla. Ovary superior, 1-celled, pointed with a long style which is curved at the apex. Capsule ovoid, 2 to 4-valved, each valve bearing on its face 1 or 2 placentae. Seeds numerous, very small, with endosperm; embryo minute.

Stamens not hairy at base; anther-cells separated from below upward, mucronate at base; capsule 2-valved .....1. OROBANCHE.
Stamen-filaments with a dense tuft of hairs at base, as if forming a ring in corolla-tube; anther-cells parallel, blunt at base; capsule 4-valved.....2. BOSCHNIAKIA.

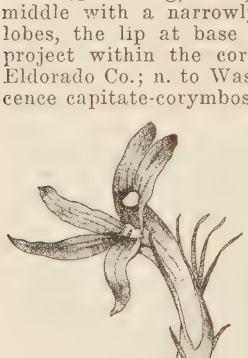
1. OROBÁNCHE L. BROOM-RAPE

Low commonly viscid-pubescent plants with violet-purple or yellow flowers. Calyx 5-cleft into acute or acuminate lobes. Corolla tubular, curved, obscurely or manifestly 2-lipped; upper lip erect or arching inwards, in ours 2-lobed; lower lip 3-lobed, spreading. Stamens included. Style deciduous; stigma peltate or with anterior and posterior lobes. Placentae 4, 2 on each valve of the capsule. (Greek orobos, vetch, and anchone, choke.)

Flowers in a raceme, or subspicate, or thyrsoid, each with 2 bractlets; corolla manifestly 2-lipped; placentae in contiguous pairs.
Herbage light colored or somewhat purplish; flowers pedicelate; calyx equally cleft.
Lobes of lower lip spreading; corolla commonly yellow or purplish.
Corolla-lobes 3 to 6 lines long; pedicels long.....1. *O. comosa.*
Corolla-lobes 2 to 2½ lines long; pedicels short.....2. *O. californica.*
Lobes of lower lip nearly erect; upper lip dark purple, the corolla otherwise yellow or nearly purplish .....3. *O. cooperi.*
Herbage dark reddish brown; flowers subsessile or short-pediceled; stems with a thickened tuber-like base.
Puberulent with very short stiff hairs; spikes of the inflorescence short and dense; not infrequent .....4. *O. tuberosa.*
Puberulent with soft or curly hairs; spikes of the panicle open, loose; very rare..
5. *O. pinorum.*

Flowers on long slender peduncles from a short more or less subterranean caudex, without bractlets; corolla obscurely 2-lipped; placentae not closely approximate in pairs.
Peduncles few or one; corolla bluish or purplish; calyx-lobes subulate....6. *O. uniflora.*
Peduncles many; corolla commonly yellow; calyx-lobes broader.....7. *O. fasciculata.*

1. **O. comòsa** Hook. Low (2 in. high); herbage glandular-puberulent, as also the calyx and corolla; flowers in a corymb or corymbose raceme; bractlets on the pedicel or at the base of the flower; calyx parted into filiform-subulate lobes ½ to ⅔ as long as the corolla; corolla dull white or pinkish, 1 to 1¼ in. long, its lips about 6 lines long; upper lip erect, 2-cleft to the middle with a narrowly V-shaped sinus; lower lip 3-parted into subulate lobes, the lip at base of the sinuses developed into tubular folds which project within the corolla; anthers woolly-pubescent.—Montane, 6000 ft., Eldorado Co.; n. to Wash. Var. VIOLÀCEA Jepson n. comb. Fig. 887. Inflorescence capitate-corymbose; calyx-lobes linear-subulate; corolla lurid purple to dark violet, 1½ to 2 in. long; upper lobes mostly obtusish; lower lobes narrowly ovate or linear; palatal folds narrow or laminate, projecting into the throat, truncate at the end.—Slopes or headlands facing the sea, Mendocino Co. to San Mateo Co. (Aphyllon violaceum Eastw.) Var. VALLÍCOLA Jepson n. var. Yerba Amargor. Stout and very compact, 3 or 4 to 12 in. high, glandular-puberulent; flowers in racemes, the racemes 2 to 7 in. long, the pedicels ½ to 1¼ in. long or the uppermost sometimes only 2 to 4 lines long; calyx deeply parted into long linear-attenuate lobes ⅔ as long as or nearly equaling the corolla; corolla whitish, pinkish or purplish, brownish tinged or veined, 1 to 1½ in. long, upper lip recurving, notched or bifid, lower lip spreading, 3-parted into narrow or lanceolate lobes; anthers woolly.—Dry hills or low valleys, 100 to 5500 (or 7500) ft., parasitic on Artemisia and other shrubs: Colusa Co. to San Joaquin Co.; Santa Clara Co. (Coyote, on Baccharis douglasii, Jepson 6196, type) to Riverside Co.; Inyo Co.



887. O. comosa var. violacea Jepson; fl. x 1.

2. **O. californica** C. & S. Stems usually simple, 2 to 6 in. high; viscid-pubescent; flowers crowded in a dense raceme; pedicels 1 to 3 (or the lower 6 to 12) lines long; calyx-segments linear-lanceolate, ½ to ⅔ as long as the corolla; corolla yellowish or purplish, ⅞ to 1 in. long, its lobes shorter and less spreading than in O. comosa; upper lip erect, lower lip slightly spreading; anthers glabrous or only slightly hairy. — Open hills, 2000 to 7000 ft.: coastal S. Cal.; inner Coast Ranges; Sierra Nevada; n. to Wash., e. to Nev. The following additional characters may be noted: corolla rather more slender and less membranous than in O. comosa; lips about 2 to 2½ lines long, in O. comosa about 3 to 4 (or 8) lines long; notch in upper lip often V-shaped and the lobes obscurely emarginate; palatal folds tubular, probably always appearing as if inside the corolla throat. The observed distinctions between this species and O. comosa var. vallicola tend to fade out, apparently, in specimens from certain areas. Var. PARÍSHII Jepson n. var. Calyx and bracts submembranous, with many parallel nerves.—Bear Valley, San Bernardino Mts. (Parish, type).

3. **O. cóoperi** (Gray) Hel. Plants 6 to 9 in. high, the stem stout or fleshy-tuberous and often scaly-imbricate, ending in a single spike or raceme, or branched into many such; flowers sessile or (especially the lower) pediceled, mostly 9 to 12 lines long; calyx-lobes barely half the length of the corolla; upper lip of corolla purple, the remainder yellow, purplish, or purplish inside; upper lip erect, 2-lobed; lower lip little spreading, all the lobes acute; palatal folds yellow; anthers very slightly hairy.—Desert mesas, 25 to 2700 ft.: Mohave and Colorado deserts; e. to Ariz. Apr.-May.

4. **O. tuberòsa** (Gray) Hel. Stout dark-colored plant 3 to 4 in. high, puberulent or (especially on the bracts) somewhat hoary-scabridulous; inflorescence a dense pyramidal thrysoid or globose cluster of short spikes or racemes; calyx unequally cleft, the lobes as long as or longer than the tube; corolla yellowish, dark purple, bluish or brown, 5 to 7 lines long, its lobes 1 line long, scarcely

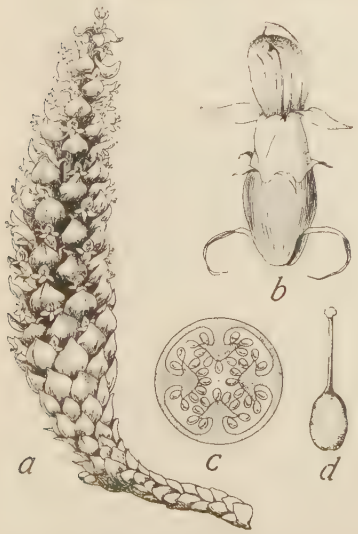
spreading; anthers very white, glabrous or after dehiscence somewhat hairy.—Summits of peaks and ridges, 500 to 4000 ft.: inner Coast Ranges from Mendocino and Solano Cos. to Monterey Co.; s. to San Bernardino Mts. and Santa Rosa Isl.; foothills Sierra Nevada from Eldorado Co. to Tuolumne Co. It is parasitic on Adenostoma fasciculatum and other shrubs. May. The white anthers and pruinose puberulence are distinctive.

5. **O. pinòrum** Geyer. Four to 6 in. high, softly puberulent; inflorescence a panicle of loose spicate racemes; calyx about half the length of the corolla, its slender teeth mostly shorter than the calyx-tube; corolla 5 to 6 lines long.—Mountain valleys, e. Humboldt Co., 1000 ft.; n. to Wash. and Ida. It is parasitic on conifers.

6. **O. uniflòra** L. NAKED BROOM-RAPE. Peduncles few or one, slender, 1½ to 5 (or 9) in. high from a short scaly nearly subterranean stem; calyx-lobes subulate, often attenuate, longer than the tube; corolla violet-tinged or blue-purple, 6 to 8 (or 12) lines long (twice the length of the calyx or more), the lobes obovate and rather large.—Sierra Nevada, 2000 to 7600 ft., from Tuolumne Co. to Modoc and Siskiyou Cos.; Napa Range, about 1000 ft.; n. to B. C., e. to the Atlantic.

888. Orobanche fasciculata Nutt.; *a*, habit x ½; *b*, anther x 6; *c*, pistil x 1; *d*, cross sect. of ovary x 3.

7. **O. fásciculàta** Nutt. Fig. 888. Scaly stem emerging from the ground 1 or 2 in. and bearing numerous fascicled peduncles 3 to 4 or 9 in. long; plants more pubescent and glandular than in no. 6; calyx-lobes broadly or triangular-subulate, usually shorter than but often exceeding the tube; corolla yellow, sometimes purple or reddish tinted, 1 to 1½ in. long.—Montane, 2000 to 9000 ft.: throughout cismontane Cal. It is parasitic on Eriogonum, Phacelia, Artemisia and other plants. June.



889. Boschniakia tuberosa Jepson; *a*, habit x ⅓; *b*, fl. x 1⅔; *c*, cross-sect. of ovary x 5⅓; *d*, pistil x 1.

2. BOSCHNIÀKIA C. A. Mey.

Stems thick, simple, arising from rather large globose tubers which are developed at the point of attachment of the parasite to the root of the host plant. Flowers without bractlets, sessile or pedicellate, more or less concealed by scaly subtending bracts, the whole forming a dense spike. Calyx short, cup-shaped, truncate behind and with teeth in front, or entirely truncate. Corolla ventricose; upper lip erect or fornicate, entire or bifid; lower 3-parted. Stamens slightly exserted. Stigma bilamellate, the lobes right and left, or 4-lobed. Capsule 4-valved, each valve with 1 placenta. (Boschniaki, a Russian botanist.)

1. **B. tuberòsa** Jepson n. comb. Fig. 889. Plants 6 to 10 in. high; tubers 2 to 3 in. in diameter, bearing 1 to 13 spikes; spikes deep red-brown in age; scales (bracts) much imbricated, very broad and obtuse; lower flowers rarely with bractlets; calyx truncate or with 1 to 4 teeth anteriorly and laterally disposed; upper lip of corolla entire, emarginate, or bifid; filaments densely bearded at base.—Ridges, 3000 to 9000 ft.: San Jacinto, San Bernardino and San Gabriel mountains; Coast Ranges from Monterey Co. to Siskiyou Co. (where abundant); South Yuba River, Sierra Nevada; n. to B. C. It is commonly parasitic on Arctostaphyllos or Arbutus roots. May. (B. strobilacea Gray. Orobanche tuberosa Hook.)

ACANTHÀCEAE. Acanthus Family

Ours shrubs with opposite undivided leaves. Flowers complete, perfect, ours with a pair of bractlets at the base of the 5-parted calyx. Corolla 2-lipped. Stamens 4 or (in ours) 2. Ovary superior, 2-celled, the ovules few. Fruit a 2-celled capsule. Seeds without endosperm.

1. BÉLOPERÒNE Nees

Shrubs, ours with opposite leaves. Flowers in rather dense clusters, but really solitary in the axils of the small opposite bracts and thus forming a 4-rowed raceme. Calyx deeply 5-parted, subtended by a pair of small bractlets. Corolla tubular, 2-lipped, the upper lip erect, the lower spreading, 3-lobed. Stamens inserted on the lower side of the corolla; anthers 2-celled, the cells separated, the lower one with a small but distinct spur at base; connective broad. Capsule clavate, having a long empty stalk-like base; cells 2-seeded. (Greek belos, an arrow or dart, and perone, something pointed.)

1. **B. californica** Benth. Stems at last becoming leafless and somewhat rush-like; herbage minutely canescent; leaves ovate, 5 to 8 lines long, on petioles about 1 line long; calyx-lobes lanceolate, 2 lines long; corolla dull red, 1⅛ to 1½ in. long, the lips ½ to ¾ in. long; lower lip 3-lobed; upper lip bearing a pair of longitudinal ridges, emarginate at apex; stamens exserted from the tube, minutely puberulent.—Western Colorado Desert; s. to L. Cal. Apr.-May.

PLANTÁGINÀCEAE. Plantago Family

Low herbs with the flowers borne on scapes and the leaves all basal. Leaves 1 to several-ribbed or -nerved. Flowers complete, regular, 4-merous, the scarious and veinless sympetalous corolla commonly withering-persistent. Ovary 2 to 4-celled, superior; style long-stigmatose, simple and filiform.

1. PLANTÀGO L. Plantain

Flowers perfect or polygamo-dioecious, each subtended by a bract, disposed in spikes or heads which are raised on a leafless scape. Sepals 4, persistent. Corolla small, salverform, with a short tube, or nearly rotate. Stamens 4, or sometimes 2, alternating with the lobes of the corolla and borne on its tube. Ovary 2 or falsely 4-celled, with 1 or more ovules in each cell. Capsule circumscissile, the seeds attached to the face of the loose partition which falls away with the lid. Seed-coat mucilaginous. (Latin name of the Plantain.)

A. Perennials; stamens 4; seeds not hollowed in the face (except no. 4).

Corolla-lobes closed over the mature capsule, forming a sort of beak; spike 6 to 12 in. long; leaves oblong-oblanceolate ..... 1. *P. hirtella.*
Corolla remaining expanded, not closed over the mature capsule.
Leaves ovate, lanceolate, or oblanceolate to obovate; corolla glabrous.
Ovules 8 to 18; leaves ovate, not fleshy ..... 2. *P. major.*
Ovules fewer (1 or 2 in each cell); leaves lanceolate to narrowly ovate.
Leaves somewhat fleshy; bracts roundish; ovules 4, 2 in each cell ..... 3. *P. eriopoda.*
Leaves not fleshy; bracts attenuate into a long point; ovules 2, 1 in each cell. 4. *P. lanceolata.*
Leaves linear, fleshy; corolla-tube externally pubescent; capsule 2 to 4-seeded ..... 5. *P. maritima.*

B. Annuals (or perhaps biennial in no. 6); leaves linear or oblanceolate.

Stamens 4; capsule 2-seeded.
Spikes pendulous in flower, at least at first, erect in fruit; posterior sepals keeled; seeds glaucous ..... 6. *P. coronopus.*

Spikes always erect; sepals not keeled; seeds hollowed on the face, boat-shaped, not glaucous.
Bracts linear, not scarious-margined.....7. *P. xerodea.*
Bracts ovate, scarious, with central midrib.
Seeds reddish or brown, smooth, shining; herbage mostly silky.....
8. *P. insularis.*
Seeds brown, puncticulate; herbage pubescent, less commonly hirsute.....
9. *P. erecta.*

Stamens 2; spikes linear or slender.
Seeds winged; capsule commonly 4-seeded; saline marshes or alkaline flats.....
10. *P. bigelovii.*

Seeds not winged.
Capsule commonly 4-seeded; scapes filiform, mostly erect.....11. *P. pusilla.*
Capsule 10 to 28-seeded; scapes stout, flexuous or ascending...12. *P. heterophylla.*

1. **P. hirtélla** H.B.K. Plants 8 to 24 in. high; scapes commonly stoutish, from thick roots; herbage roughish-pubescent, especially the scapes and leaf-ribs; leaves oblong-oblanceolate to narrowly oblong or obovate, acute, tapering below into a broad petiole, 3 to 12 in. long and ⅝ to 1¾ in. wide; spikes 6 to 12 in. long, dense except at the base; corolla persistent, its lobes closed over the capsule, forming a sort of beak; seeds 3, flattish on one side.—Clay banks along the coast, Humboldt Co. to San Diego Co.

890. Plantago major L.; *a*, habit x ½; *b*, protogynous flower, showing pistillate stage, followed by staminate stage, *c*, x 3.

2. **P. màjor** L. Common Plantain. Fig. 890. Plants 6 to 12 in. high; herbage glabrous; leaves narrow- to round-ovate, 3 to 6 in. long, entire or toothed, prominently 5 to 7-ribbed, the ribs converging at base into a broad petiole 4 to 5 in. long; scapes commonly curved-ascending, not as long as the leaves, rarely longer, bearing an elongated spike 3 to 6 in. long; sepals green in the middle, the edges scarious; capsule 2-celled with 4 to 8 seeds in each cell, circumscissile near the middle.—Nat. from Eur., common in low fields and waste places. It is called by the Indians "White Man's Foot," since it has closely followed the advance of civilization, springing up about the earliest frontier settlements. Var. asiática Dec. Leaves thin, upright; scapes erect, surpassing the leaves; spike below less dense; capsule circumscissile near the base and well within the calyx.—Stockton; Sierra Nevada.

3. **P. eriópoda** Torr. Plants 4 to 13 in. high, the scapes exceeding the leaves; root-crown usually with a mass of brownish wool; leaves oblong-lanceolate to oblong-ovate, fleshy-coriaceous, mostly glabrous, 3 to 7-nerved on stout, rather short petioles, 3 to 5 in. long; scapes mostly puberulent; spikes dense or sparsely flowered, ¾ to 4 in. long; bracts broadly ovate or roundish, scarious-margined, sometimes pubescent-ciliate; capsule ovoid, 2 lines long, slightly exceeding the calyx; ovules 2 in each cell; seeds as many or fewer.—Moist saline soil, Humboldt and Siskiyou Cos.; n. to Can.

4. **P. lanceolàta** L. Ribwort. English Plantain. Erect, 14 to 28 in. high, the scapes sulcate and angular, longer than the leaves; herbage somewhat villous with short hairs, often rusty-pilose; leaves erect or spreading, oblong-lanceolate, tapering at base into a slender petiole strongly 3 to 5-ribbed, 3½ to 8 in. long; spike short-cylindric, ¾ to 1½ (or 2½) in. long; bracts ovate, abruptly attenuate into a point half as long to as long; sepals scarious, the two lower often combined into one; corolla nearly rotate; stamens twice as

long as the corolla; capsule 2-seeded.—Moist agricultural lands throughout Cal.; nat. from Eur.

5. **P. marítima** L. GOOSE-TONGUE. Low, 2 to 9 in. high, the many leaves and the scapes borne on a stout taproot; leaves linear or narrowly linear, thick and fleshy, 2 to 3 (or 8) in. long; spike cylindrical, 1¼ to 2 in. long; sepals somewhat carinate; corolla-tube pubescent externally; capsule 2 to 4-seeded.—Ocean shore from Monterey Co. to Humboldt Co.; n. to Alas.; Eur., Asia. Also called Sea Plantain.

6. **P. coronopus** L. Plants 8 to 10 in. high, the scapes much exceeding the leaves; herbage coarsely hairy, very densely hairy at the summit of the scapes, more or less glabrate; leaves narrowly oblanceolate, sparingly and saliently incised, 3 to 5 in. long, the root-crown woolly-pilose between the leafy bases; spikes slender-cylindric, very dense, 3 to 3¼ in. long, at first pendulous, erect in fruit; bracts ovate, attenuate or long-acuminate; sepals ovate, ciliate, the 2 posterior keeled on the back; corolla-lobes broadly lanceolate, the tube pubescent; seeds 3, glaucous.—Sea cliffs: Santa Cruz and Monterey Cos.; sparingly introduced from Eur.

7. **P. xeròdea** Morris. Stems few to many from the base, 1 to 4 in. high; herbage very silky when young, pilose when older; spikes dense, the bracts ¾ to 1½ times longer than the flowers; sepals oblong, the outer very narrowly scarious-margined, the inner more broadly and the two sides often unequally margined; corolla-lobes ovate, acute.—Desert plains and mesas, 2500 to 4500 ft.: Mohave and Colorado deserts; Panamint Range.

8. **P. insulàris** Eastw. Habit and spikes of P. erecta; herbage more or less silky; bracts ovate, scarious with brown midribs, the midribs pubescent or villous; seeds red or yellowish, smooth and shining.—Coastal S. Cal. Var. FÁSTIGIÀTA Jepson n. comb. Scapes and leaves from a short stem, very leafy; leaves 2 to 3 lines broad; herbage densely silky; seeds red-brown.—Colorado Desert, about sea level. (P. fastigiata Morris.) Var. SCARIÒSA Jepson n. comb. Habit and spikes of P. erecta; leaves and scapes basal; bracts glabrous or only the midrib puberulent; seeds smooth, red or yellow.—Mohave and Colorado deserts and bordering mts., 2000 to 4000 ft.; upper San Joaquin Valley, 500 ft.: San Diego. (P. scariosa Morris.)

891. Plantago erecta Morris; *a*, habit x 1; *b*, fl. x 4½.

9. **P. erécta** Morris. Fig. 891. Plants 2½ to 5 (or 12) in. high, commonly very erect but sometimes spreading, the scapes few to many; herbage soft-pubescent and green, or the scapes sometimes silky at summit at first; spikes oblong, sometimes very short (capitate) or sometimes elongated, ⅓ to 1½ in. long, 4 to 5 lines wide; bracts ovate, the green midrib with a scarious border; sepals roundish or ovate, obtuse, scarious with broad central midrib, the midribs more or less hairy but the scarious border usually glabrous; seeds 2.—Common on hillsides and grassy flats: valleys and foothills of central and n. Cal., 25 to 1500 ft.; S. Cal., up to 4500 ft. Apr.-May; fr. June.

10. **P. bigelòvii** Gray. Similar to P. pusilla but stouter; plants 2 to 7 in. high; leaves narrowly oblanceolate to linear-filiform, ½ to as long as the scapes; spikes ¼ to 1⅝ in. long, 2 to 2½ lines wide; bracts commonly fleshy-keeled; seeds 4 (1 to 7), black, winged at one end or narrowly all around, or the wing scarcely evident.—Low valleys, 10 to 500 ft.: Sacramento and San Joaquin valleys; Contra Costa Co. to Monterey Co. Apr.-May.

11. **P. pusílla** Nutt. Inconspicuous plant 1 to 3¼ in. high, the scapes very slender; scapes and leaves erect; leaves filiform to linear, ¼ to ½

as high as the plant; spikes very slender, 1 to 4 in. long, 1 to 1½ lines wide; bracts with thickened or fleshy keel; sepals obovate; corolla minute; stamens 2; seeds 4, dark-brown or black, coarsely pitted, not winged.—W. San Diego Co.; said to be introduced from Atlantic coast.

12. **P. héterophýlla** Nutt. Small slender annuals 1 to 3 in. high; herbage puberulent; leaves very narrowly linear, 1 to 2 in. long, occasionally with a few denticulations or divergent lobes; spikes slender, 2 to 5 in. long; capsule conical-oblong and at length considerably surpassing the bract and calyx, 10 to 28-seeded; seeds oblong, usually angled by mutual pressure, obscurely rugose-pitted.—Low sandy ground, rare in Cal.: Deer Creek, Tulare Co. foothills; Tex. to Fla. and N. J.

RUBIÀCEAE. Madder Family

Shrubs or herbs with opposite or whorled entire leaves. Flowers perfect or polygamous, rarely unisexual. Calyx, corolla and stamens 4-merous (5-merous in Sherardia). Calyx coherent with the ovary, its limb sometimes obsolete. Stamens alternate with the lobes of the corolla and inserted on its tube. Ovary in ours 2-celled, in fruit splitting into 2 (or 4) indehiscent 1-seeded portions; styles 1 or 2. Embryo in fleshy or horny endosperm.—A very large family including the Cinchona and Coffee Plant.

Herbs or slightly suffrutescent plants.
  Flowers in cymes or solitary, pediceled.
    Corolla rotate; leaves in apparent whorls.....1. Galium.
    Corolla funnelform; leaves opposite.....2. Kelloggia.
  Flowers in involucrate heads; corolla funnelform.....3. Sherardia.
Large shrub; corolla tubular-funnelform; flowers in dense globose long-peduncled heads...
4. Cephalanthus.

1. GÀLIUM L. Bedstraw. Cleavers

Herbs or some species slightly suffrutescent, with slender square stems. Leaves in apparent whorls; stipules large and leaf-like, resembling the blade of the leaves, so that the leaves appear to be placed several in a whorl. Flowers cymose, peduncled. Calyx-limb obsolete. Corolla rotate, 4 (or 3)-cleft. Stamens 4, short. Ovary 2-lobed, 2-celled, 2-ovuled; styles 2. Fruit didymous, of two globular halves, dry or fleshy, separating when ripe into 2 seed-like indehiscent 1-seeded carpels. (Greek gala, milk, certain species being used to curdle milk.)

A. Leaves 6 to 8 in a whorl; fruit hispid or rugose-papillate.

Slender plants, the stems with filiform diffuse branches; leaves linear, 2 to 3 lines long; fruit hispid; annual.....1. *G. parisiense.*
Coarser plants, the stems mostly simple, commonly erect, sometimes diffuse or reclining or branching; leaves oblanceolate, ½ to 1 in. long.
  Fruit large (2 lines in diameter), papillate-rugose, on short stout recurved pedicels; annual.....2. *G. tricorne.*
  Fruit small (½ to 1¾ lines in diameter), on slender straight pedicels, hispid (sometimes subglabrous in no. 4).
    Annual, with a taproot; flowers 1 to few, cymose on long axillary peduncles or more numerous and becoming cymose-paniculate; fruit hispid.....
3. *G. aparine.*
    Perennial, from slender creeping rootstocks, often arising from a taproot.
      Flowers many to numerous, cymose-paniculate; fruit hispid with short scattered hairs or nearly glabrous.....4. *G. asperrimum.*
      Flowers 2 or 3, cymose, the cymes on axillary peduncles; fruit densely white-hispid with long hairs.....5. *G. triflorum.*

B. Leaves in whorls of 4 (sometimes 5 or in no. 6 reduced to 2).

1. Plants from slender or filiform roots.

Annual, 3 to 5 in. high; upper leaves often reduced to 2; fruit hispid.....6. *G. bifolium.*
Perennial; leaves in whorls of 4 or 5; fruit glabrous.
  Slender erect plants 5 to 18 in. high; fruit on elongated capillary pedicels, the pedicels 2½ to 6 lines long.....7. *G. trifidum.*
  Low matted plants 2 to 4 in. high; fruit on short thick pedicels, the pedicels 1 to 1½ lines long.....8. *G. brandegei.*

2. Plants from woody rootstocks; perennial.

Fruit glabrous or sparsely hairy with short hairs.
  Mature fruit fleshy or berry-like, large (or small in no. 11).
    Plants forming low dense tufts (2 to 5 in. high); stems densely leafy .
      Leaves narrowly linear-subulate, acerose, glabrous.....9. *G. andrewsii.*
      Leaves narrowly linear, abruptly acute, cuspidate, hairy...10. *G. ambiguum.*

Plants with the stems more open, always taller, rarely tufted.
Stems slender at the base; herbage hispid-ciliate; leaves small, ovate, 2 to 5 lines long ..... 11. *G. californicum.*
Stems often coarse woody at the base.
Fruit glabrous; plants glabrous to decidedly scabrous.
Flowers in cymes, the cymes paniculate; plants ½ to 1½ ft. high.
Leaves oblong-lanceolate or oblong; flowers purple..... 12. *G. bolanderi.*
Leaves broadly ovate; flowers white..... 13. *G. sparsiflorum.*
Flowers on axillary peduncles, mostly solitary; long woody climbers 2 to 5 ft. long..... 14. *G. nuttallii.*
Fruit sparsely hispid or hispidulose (or glabrous in age); flowering branchlets open, the cymes few-flowered or reduced to one; cinereous-pubescent throughout ..... 15. *G. pubens.*
Mature fruit dry.
Flowers solitary or in few-flowered cymes, terminal or borne in the uppermost axils of very leafy much compacted branchlets; Santa Barbara Isls.... 16. *G. catalinense.*
Flowers numerous in a compact panicle; sterile branchlets below very leafy, very conspicuous; n. Cal..... 17. *G. boreale.*
Fruit, at least when mature, densely hispid with hairs longer than or equaling the diameter of the fruit.
Leaves linear to lanceolate.
Plants erect or tufted; leaves linear, dark green.
Leaves usually 6 to 14 lines long, glabrous or scabrous on the margin..... 18. *G. angustifolium.*
Leaves 2 to 6 or 8 lines long, hispid throughout..... 19. *G. siccatum.*
Plants diffuse with long woody branches; leaves lanceolate-acuminate, 2 to 4 lines long, light green..... 20. *G. stellatum.*
Leaves ovate.
Plants diffuse, reclining, with long woody branches..... 21. *G. hallii.*
Plants erect or tufted, herbaceous.
Fruit 1½ to 2 lines in diameter, the hairs whitish or tawny, considerably longer than the body; leaves broadly ovate, 4 to 7 lines long..... 22. *G. multiflorum.*
Fruit 1 line or less in diameter, the hairs white, about equaling the body in length; leaves ovate, 2 to 3 lines long.
Plants 8 to 12 in. high, usually glabrous (except in var.)..... 23. *G. matthewsii.*
Plants dwarf, less than 6 in. high, densely scaberulous-pubescent throughout..... 24. *G. parvifolium.*

892. Galium aparine L.; *a*, fr. branchlet x ½; *b*, fl. x 4; *c*, fr. x 4.

1. **G. párisiénse** L. WALL GALIUM. Stem branched from the base, the branches and particularly the branchlets very slender or almost filiform, 6 to 10 or 12 in. high, finely scabrous; leaves in whorls of 6, oblong-spatulate or linear-lanceolate or linear-oblong, acute, 2 to 3 lines long; cymes several-flowered, paniculate, the peduncles and pedicels filiform; flowers whitish, very small, ¼ to ½ line broad; fruit small, less than ½ line long, decidedly hispid. — Humboldt and Mariposa Cos.; nat. from Eur. Var. ÁNGLICUM Huds. Diffusely branching, 6 to 18 in. high, very leafy below; leaves 3 to 5 lines long; fruit merely granulate, not hispid. — Native of Eur.; introduced into Sonoma, Humboldt and Eldorado Cos.

2. **G. tricórne** Stokes. CORN GALIUM. Stems stout, rather simple, 6 to 18 in. long, the angles callous, with stoutish recurved prickles; leaves in whorls of 6 to 8, narrowly oblanceolate or linear, callous-margined and thickly beset with recurved prickles 6 to 9 lines long;

axils mostly fruit-bearing throughout; fruit on stout recurved pedicels (4 to 6 lines long), mature fruit comparatively large, 1½ lines long, 2 lines or more broad, papillate-rugose, not hairy.—Grain fields, Sonoma Co. and Mariposa Co.; nat. from Eur. Fr. June.

3. **G. aparine** L. Goose Grass. Fig. 892. Stems with a slender taproot, diffuse or climbing over herbaceous plants, 1 to 2 or 3 ft. long, forming rather thick coarse mats, or sometimes erect and only 6 in. high in dry situations; whole herbage setulose or hispidulous-roughened; stems acutely quadrangular, internodes 1½ to 3 (or sometimes 4) in. long; leaves 6 to 8 in a whorl, oblong-oblanceolate to almost linear, obtuse, or the upper acute, mucronate, tapering to a narrow base, ½ to 1¼ in. long, decidedly scabrous-roughened; flowers usually few, 1 or 2 in a cyme on long axillary peduncles (1 to 2 in. long), or more numerous and becoming cymose-paniculate; fruit 1½ to 1¾ lines in diameter, densely hispid with short stiff hooked bristles which are usually shorter than the body.—Half-shaded or grassy places, foothills and montane valleys, 100 to 4500 ft., throughout Cal., introduced from Eur.; Atlantic coast; Eur., Asia.

4. **G. aspérrimum** Gray. Stems diffuse or reclining, 1½ to 3 ft. high, from a weak slender rootstock, smooth or minutely scabrous on the margins, the internodes 2 to 3 in. long; leaves 6 to 8 in a whorl, broadly linear to oblanceolate, obtuse or acute, abruptly mucronulate, ½ to 1 in. long, tapering to a narrow base, scabrous along the margins and midrib, or glabrous, rather thin in texture; flowers many to numerous, cymose-paniculate, borne on axillary or terminal branchlets; fruit less than 1 line in diameter, hispid with short scattered hairs (shorter than the body) or almost glabrous.—Shady places in the foothills, 1700 to 3000 ft.: Santa Clara Co. to Humboldt Co.; Mariposa and Plumas Cos.: n. to Ore., e. to Nev.

5. **G. triflòrum** Michx. Sweet Bedstraw. Fig. 893. Stems slender, erect or reclining, 8 to 18 in. high, leafy, smooth or somewhat scabrous on the angles, arising from a slender creeping rootstock, the fibrous rootlets often red in color; internodes about 1¼ to 2 in. long; leaves in whorls of 6, ovate-oblong to broadly obovate, 6 to 14 lines long (those on the branches sometimes 4 lines long), cuspidate, very thin in texture and usually glabrous or minutely scabrous on the margins and midrib; flowers 2 or 3 in a cyme, the cymes borne on axillary peduncles 1 to 1½ in. long; fruit small, ¾ to 1 line broad, densely covered with soft white slightly hooked hairs which exceed the body in length.—Woody thickets, 200 to 6300 ft.: San Bernardino Mts.; Coast Ranges from San Mateo Co. to Siskiyou Co.; Sierra Nevada from Fresno Co. to Placer Co. and n. to Modoc Co.; e. to Atlantic and n. tc Can.

893. Galium triflorum Michx.; *a*, fr. branchlet x 1; *b*, fl. x 4; *c*, fr. x 6.

6. **G. bifòlium** Wats. Stem erect, simple or slightly branching, glabrous, unarmed, 3 to 5 in. high; leaves oblanceolate to nearly linear, mostly in whorls of 4, the large pair about ½ in. long (5 to 7 lines), the alternate ones smaller, or the uppermost whorls with leaves reduced to a single pair; pedicels axillary and terminal, 1-flowered, in fruit about equaling the leaves; fruit 1 to 1½ lines in diameter, hispid with whitish hooked bristles.—Montane, 5000 to 8000 ft.: Trinity and Humboldt Cos. to Siskiyou Co.; Sierra Nevada from Fresno

894. Galium trifidum L.; *a*, fl. stem x 1; *b*, fl. x 3; *c*, fr. x 4.

Co. to Shasta Co.; n. to Wash., e. to Col.

7. **G. trifidum** L. CROUP-WEED. Fig. 894. Stems from very slender rootstocks, ascending, slender and weak, 5 to 18 in. high, much branched and intertangled, 4-angled and comparatively smooth; branches commonly in 2s; leaves in 4s or 5s, oblong to linear-spatulate, obtuse, not bristle-pointed, 2 to 9 lines long, very thin, obscurely scabrous on the margins; flowers minute, on capillary pedicels; fruit glabrous, dry, about 1 to 1¼ lines broad. —Marshes or boggy places, 10 to 5400 ft., almost throughout cismontane Cal.; n. to B. C., e. to Lab. and N. Eng.; Eur., Asia.

8. **G. brandègei** Gray. Closely related to G. trifidum from which it is distinguished by its peculiar habit of forming dense low mats, the weak stems prostrate or ascending, 2 to 4 in. long, very leafy; leaves obovate-spatulate, in whorls of 4, 2 to 3 lines long, equaling or exceeding the short internodes; fruit glabrous on short stocky pedicels, the pedicels often not exceeding the fruit in length.—Montane, 5200 to 8500 ft., rare: Sierra Nevada from Mariposa Co. to Modoc Co.; e. to N. Mex.

9. **G. andréwsii** Gray. Fig. 895. Plants commonly densely matted, the leafy flowering stems erect, 2 to 4 in. high, the prostrate stems rooting at the joints; herbage grayish, glabrous or sparsely scabrous; leaves in whorls of 4, crowded, subulate, pungent, rigid, cuspidate-acuminate, 2 to 4 lines long; flowers solitary or in 3s, terminating the branchlets, very small, perfect; corolla white; fruit on short somewhat recurved pedicels, 1 to 1½ lines wide, glabrous, berry-like, purple in age. — High dry ridges, 1500 to 4600 ft.: Coast Ranges, mostly the inner, from Lake Co. to San Luis Obispo Co.; s. to San Diego Co.

895. Galium andrewsii Gray; *a*, habit x 1; *b*, fr. x 3; *c*, fl. x 3.

10. **G. ambíguum** Wight. Caespitose, 2 to 5 in. high, the branches densely clothed with stiffish leaves; herbage dark green, sparsely hairy; leaves narrowly linear, abruptly acute, cuspidate, 3 to 6 lines long; flowers apparently few, solitary in the axils; fruit black (when dry), glabrous.—High peaks, Trinity and Humboldt Cos.: Yollo Bolly; Buck Mt.

11. **G. californicum** H. & A. Plants usually low, erect, 3 to 6 or 8 in. high, or sometimes diffuse and the stems 1 ft. long; stems slender at the base, arising from a more or less slender rootstock; herbage more or less hispid with

widely spreading hairs; leaves thinnish, ovate or oval, apiculate-acuminate, 2½ to 5 or sometimes 6 lines long, usually hispidulose, especially on margins and midrib; flowers dioeciously polygamous, the fertile ones solitary on short pedicels at the ends of the branches or in the upper forks, recurved in fruit, the sterile ones terminal and usually in 3s; corolla yellowish with ovate-lanceolate lobes; fruit small, berry-like, purple, glabrous or nearly so.—Common on open hills, 300 to 1500 ft.: Coast Ranges from Humboldt Co. to Monterey Co.; s. to Riverside Co.; Santa Cruz Isl. Var. MIGUELÉNSE Jepson n. comb., a very small shiny-leaved form from San Miguel Isl. (G. miguelense Greene.)

12. **G. bolánderi** Gray. Stem erect or diffuse from a woody root, 6 to 10 or 14 in. high, forming a thick tuft or sometimes elongated and climbing; angles of the stems scabrous; leaves oblong-lanceolate or oblong, acute, usually narrowed at the base, glabrous or hispid-ciliate, 2½ to 5 lines long; flowers in small usually terminal cymes, or sometimes cymose-paniculate; pedicels slender, 2½ to 3½ lines long, often recurved in fruit; corolla deep red-purple; fruit fleshy, glabrous, purple in age, often 2 lines in diameter.—Mountain valleys or flats, 1800 to 4600 ft.: Solano Co. to Humboldt Co., and n. to Siskiyou Co., thence s. in the Sierra Nevada to Mariposa Co.

13. **G. sparsiflòrum** Wight. Erect perennial, 8 to 12 in. high; herbage hispidulose to nearly glabrous; leaves in 4s, unequal, oval or broadly ovate, mostly rather large, 4 to 6 or 8 lines long and 3 to 5 lines broad, cuspidate-pointed, often indistinctly 3-nerved, thin and membranous, sparsely hairy above with short straight hairs; flowers several to numerous, cymose-paniculate; pedicels capillary; fruit glabrous.—Mountain meadows, 6200 to 7000 ft.: Fresno and Tulare Cos.

14. **G. nuttállii** Gray. Suffrutescent from a woody root, with long woody branches, often climbing 2 to 5 ft. high; branches often tinged red or purple; plants glabrous and nearly smooth or angles of the stem and margins of the leaves scabrous or hispidulous; branches very leafy, the internodes of flowering branchlets ¼ to ½ in. or less long; leaves in whorls of 4, thickish, oval to linear-oblong, mucronulate or obtuse, mostly small, 2 to 4 lines long (1 to 2 lines on the branchlets); flowers mostly solitary, occurring in the axils of the leafy branchlets; peduncles short and thick, 1 to 2 lines long; fruit smooth, fleshy, purple in age, often 2 lines in diameter and usually equaling or exceeding the pedicels.—Common in thickets: Coast Ranges from Humboldt Co. to Monterey Co. and s. to San Diego Co., 200 to 2400 ft.; Sierra Nevada, 2000 to 7000 ft., from Tuolumne Co. to Fresno Co.

15. **G. pùbens** Gray. Stems herbaceous, erect or diffuse, 1 to 1½ ft. high, distinctly 4-angled and rather sparsely leafy, the internodes often 1½ to 2 in. long; herbage cinereous with a fine partly soft, partly scabrous pubescence; leaves in 4s, broadly oval to oblong-linear on the branchlets, thick, ¼ to ½ in. long, mostly not pointed; flowers dioecious, axillary or terminal, the sterile in several-flowered cymes, the fertile fewer, often occurring singly or in pairs; young fruit minutely pubescent, becoming fleshy and glabrous, purple in age.—Sierra Nevada, 2000 to 5000 ft., from Mariposa Co. to Tulare Co. Var. GRÁNDE Jepson n. comb. Diffusely branching and densely cinereous-pubescent; leaves narrowly ovate, mostly less than 5 lines long; mature fruit hispid with fine hairs.—Shady places, 2000 to 4000 ft.: San Gabriel and San Bernardino mountains. (G. grande McCl.)

16. **G. cátalinénse** Gray. Stems stoutish, erect, 3 to 4 ft. high, woody below, quadrangular, the nodes with a swollen ring, the mostly few branches bearing numerous short slender compacted branchlets, thus forming very thick tops to the plants; herbage minutely soft-puberulent or almost glabrous, not scabrous; leaves mostly in 4s, the uppermost often in pairs, narrowly oblong, obtuse or mucronate, 1-nerved, ½ to 1 in. long on the main branches, 2 to 4 lines on the terminal branchlets, either sessile by a contracted base or short-petioled; flowers on short slender pedicels, solitary or in a few-flowered cyme, borne terminally on the very leafy branchlets or in the uppermost axils; corolla white; fruit dry, sometimes glabrous, sometimes sparsely covered with soft straight hairs.—Rocky slopes and cliffs, Santa Barbara Isls.

17. **G. boreàle** L. Stems erect, 1 to 2 ft. high, arising from slender woody rootstocks, with conspicuous very leafy sterile branchlets below; herbage glabrous; leaves linear to broadly lanceolate, thick, distinctly 3-nerved, mostly obtuse, ½ to 1¼ in. long, those of the sterile branchlets often much smaller; flowers numerous in a more or less condensed terminal panicle of cymes; corolla white; fruit small (less than ½ line in diameter), hispidulous.—Montane, 3500 to 7000 ft.: e. Humboldt Co.; Shasta Co.; n. to Alas. and Can., e. to N. J.; Eur., Asia.

18. **G. angustifòlium** Nutt. Erect shrubby perennial 1 to 4 ft. high, with rigid virgate branches; herbage minutely scabrous-puberulent; leaves in whorls of 4, narrowly linear, mucronulate, ½ to 1 in. long or shorter on the branches; flowers numerous, polygamo-dioecious, greenish white, in more or less condensed cymes, these forming a narrow panicle; fruit densely covered with long silky white hairs which are longer than the body.—Foothills and mts., 100 to 5500 ft., from Monterey Co. to San Diego Co. Var. SUBGLÀBRUM Jepson n. var. Lower more tufted form with usually broader leaves; mostly glabrous throughout.—Pine belt in mts. of S. Cal.: Whitewater Basin (C. M. Wilder 1113, type); n. to Monterey.

19. **G. siccàtum** Wight. "Perennial, 1 to 4 ft. high, erect and branched or bushy when growing in some situations; cinereous-puberulent throughout; leaves in 4s, not rigid, linear, 4 to 8 lines long, mucronulate; inflorescence cymose-paniculate; flowers polygamous, greenish yellow, numerous; fruit a line broad, densely hispid with straight bristles" (ex char.).—Del Mar, San Diego Co.; perhaps also in San Jacinto and San Antonio mountains. Var. ANOTÌNUM Jepson n. var. Dwarf tufted form less than 6 in. high; leaves densely clothing the branches, 2 to 4 lines long.—Mt. San Antonio (Peirson 215, type).

20. **G. stellàtum** Kell. Stems diffuse and spreading from the woody base, 5 to 10 in. long, the bark whitish or cream-color as in G. hallii, exfoliating in age; herbage minutely puberulent throughout; old leaves whitish, very thin, often ½ in. long, persisting on the main branches; leaves of the season green, rigid, ovate to narrow-lanceolate, acuminate-cuspidate, 2 to 4 lines long, midrib prominent, lateral veins not developed; flowers paniculate, crowded; corolla white, about 1 line broad; fruit small, the body dark, about ½ line broad, covered with white silky hairs nearly a line long.—Rocky cañons and dry hills, 4000 to 8000 ft.: Colorado Desert to Inyo Co.; e. to Nev. and Ariz.

21. **G. hállii** Jtn. Stems reclining, from a perennial root-crown, 1 to 2 ft. long, woody below; herbage minutely to densely scabrous-pubescent; bark thin, exfoliating, white-shining in age; leaves spreading in whorls of 4, densely clothing the lateral branchlets, very thin and often turning tawny or creamy white in age, broadly ovate, obscurely mucronulate, 3 to 5 lines long, midrib prominent; flowers creamy white, numerous on the drooping tips of the lateral branchlets; fruit large, the body dark, about 1 line across and densely covered with white or creamy white silky hairs which slightly exceed the body in length.—Montane, 5000 to 7000 ft.: San Gabriel Mts.; Mt. Pinos; mts. of Kern Co.; Providence Mts.

22. **G. multiflòrum** Kell. Stems 6 to 12 in. high, from a suffrutescent base, often in tufts; herbage glabrous, pruinose-puberulent or sometimes pubescent; leaves in whorls of 4, broadly ovate, 4 to 7 lines long and 2 to 3 lines broad, midrib and one or two lateral nerves more or less prominent; flowers short-pediceled, cymose-paniculate or crowded in the upper axils; fruit densely clothed with long tawny hairs, the hairs straight, considerably longer than the body, making the fruit and hairs often 2½ to 3 lines in diameter.—Arid slopes, 4000 to 4500 ft.: San Jacinto Mts.; Lassen Co.; w. Nev. Var. HIRSÙTUM Gray. Plants low, tufted, 3 to 8 in. high, cinereous-pubescent throughout.—High montane, 5900 to 10,000 ft.: n. Lake Co. to Yollo Bolly Mts.; Sierra Nevada, mostly east summits or east slopes, from Inyo Co. to Modoc Co.

23. **G. matthèwsii** Gray. Stems erect, branching, 8 to 12 in. high, from a woody base; herbage mostly glabrous; leaves rigid, ovate-lanceolate, cuspi-

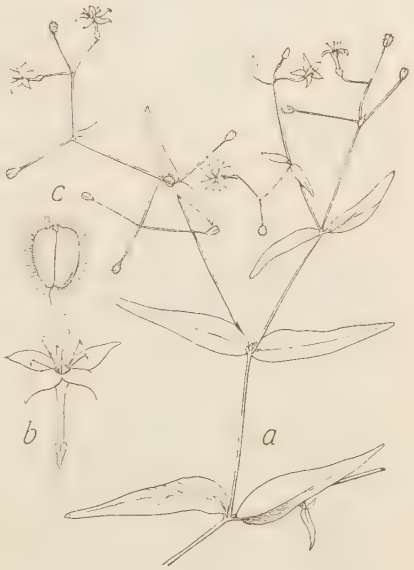
date-acute, 2 to 3 lines long, with a very prominent midrib and no lateral veins; flowers numerous, cymose-paniculate, short-pediceled; corolla less than 1 line broad; fruit small, ¾ to 1½ lines in diameter, densely clothed with very short white hairs.—East slope of Sierra Nevada in Inyo Co., 8000 to 9000 ft.; e. to Nev. Var. SCÁBRIDUM Jepson n. var. Plants densely hirsute throughout.—Silver Cañon, White Mts., 7500 ft. (Jepson 7210, type).

24. **G. parvifòlium** Jepson n. comb. Dwarf tufted plants 2 to 6 in. high, scabrous-puberulent throughout, with thick woody rootstocks and branchlets densely clothed at base with old leaves; leaves in whorls of 4, minute (1 to 2 lines long), ovate, acute, abruptly mucronate; basal leaves turning tawny with age and closely sheathing the base of the branches, very small, usually less than 1 line; upper whorls more distant (the nodes ½ in. or more apart), their leaves narrowly to broadly ovate and often 2 lines long, midrib prominent, the lateral veins not developed; flowers small, dioecious, reddish purple, cymose and short-pediceled; fruit less than ½ line in diameter, covered with short straight silky hairs about equaling the body in length.—Arid montane slopes, 6700 to 10,000 ft.: Santa Rosa, San Jacinto, San Bernardino and San Gabriel mountains; e. to southern Nev. (G. multiflorum var. parvifolium Parish.)

2. KELLÓGGIA Torr.

Slender perennial herb with opposite leaves and interposed stipules. Flowers in loose forking terminal cymes. Calyx-tube obovoid, somewhat laterally flattened, covered with stiff short bristles. Corolla funnelform. Ovary 2-celled, each cell 1-ovuled. Fruit densely uncinate-hispid, splitting at maturity into 2 closed carpels. (Dr. Albert Kellogg, pioneer botanist, one of the founders of the California Academy of Sciences.)

1. **K. gàlioides** Torr. Fig. 896. Stems several, often many from the base, 8 to 14 in. high; leaves lanceolate (rarely narrowly ovate), ¾ to 1½ in. long; corolla pinkish, 2 to 3 lines long, its lobes 4 (rarely 5).—Dry ridges and meadow borders, 4000 to 7200 ft.: San Jacinto and San Bernardino mountains; Sierra Nevada from Tulare Co. to Mariposa Co., thence n. to Siskiyou Co.; n. to Wash., e. to Utah and Ariz.



896. Kelloggia galioides Torr.; *a*, fl. branchlet x ½; *b*, fl. x 2; *c*, fr. x 2.

3. SHERÁRDIA L.

Slender annual with square stems and whorled leaves without stipules. Flowers small, blue or pinkish, in heads surrounded by a deeply divided involucre. Calyx-limb of 4 to 6 teeth, which grow after flowering and crown the fruit. Corolla funnelform, the limb 4 or 5-lobed. Stamens 4 or 5. Style filiform, slightly 2-cleft. Fruit dry, didymous, separating into 2 indehiscent 1-seeded carpels. (Dr. Wm. Sherard, a patron of Dillenius and friend of John Ray.)

1. **S. arvénsis** L. FIELD MADDER. Three to 6 in. high, hispidulous-roughened or nearly glabrous; leaves in whorls of 4 to 6, lanceolate to oblong, pungent; flowers subsessile, 2 or 3 in a head; involucre in fruit 3 to 4 lines long, its lobes 6 to 8, ovate or ovate-lanceolate.—Native of Eur., naturalized in pasture lands near the coast from San Mateo Co. to Marin Co., often closely matting the ground.

897. Cephalanthus occidentalis L.; *a*, fl. branchlet x ½; *b*, fl. x 1½; *c*, fr. x 1½.

4. CEPHALÁNTHUS L.

Button Bush

Shrub or small tree with opposite or ternate leaves. Flowers densely aggregated into spherical peduncled heads. Calyx-tube inversely pyramidal, the limb 4-toothed. Corolla narrowly funnelform, slender, the small limb 4-cleft. Style filiform, much exserted; stigma capitate. Fruit dry and hard, obpyramidal, at length splitting from the base upwards into 2 to 4 one-seeded achene-like portions. (Greek kephale, a head, and anthos, a flower.)

1. **C. óccidentàlis** L. Button-Willow. Fig. 897. Shrub or tree, 6 to 20 (or 30) ft. high; bark clay-gray, young branches reddish; leaves elliptic- to oblong-ovate, slightly attenuate, truncate or obtuse at base, entire, 2¼ to 5 in. long, on petioles 2 lines long, with short or minute intervening stipules; peduncles 1 to 3 in. long; heads ¾ to 1 in. in diameter; calyx greenish; corolla white, 4 lines long, the segments obtuse, tipped with black; fruit nearly 2 lines long; seed 1 line long, flattened, acutely margined.—Along living streams, 10 to 1000 ft.: Great Valley, common; Sierra Nevada foothills, less frequent; n. to Can., e. to the Atlantic. Aug.-Sept. The fruiting heads and fruits recall those of the Sycamore.

CAPRIFÒLIÀCEAE. Honeysuckle Family

Erect or twining shrubs, or small trees. Leaves opposite, without stipules or with false foliaceous appendages resembling stipules. Flowers complete. Calyx-tube adnate to the ovary, the toothed limb commonly insignificant. Corolla tubular or rotate, regular or irregular, 5-lobed or rarely 4-lobed. Stamens (in ours) as many as the lobes of the corolla and inserted on its tube or base. Ovary inferior, 2 to 5 (rarely 1) -celled; style 1. Fruit a berry or berry-like drupe, or sometimes a dry pod. Endosperm fleshy; embryo small.

Corolla rotate to deeply saucer-shaped, regular; style short; flowers in compound cymes.
  Leaves compound; fruit berry-like, 3 to 5-seeded ..... 1. Sambucus.
  Leaves simple; fruit a 1-seeded drupe ..... 2. Viburnum.
Corolla tubular to funnelform; style commonly elongated; leaves simple.
  Very low creeping vine; flowers in pairs on a thread-like peduncle ..... 3. Linnaea.
  Shrubs, erect or twining.
    Berry snow-white, 1 or 2-seeded; corolla open-campanulate or tubular-funnelform, regular; stamens 4 or 5 ..... 4. Symphoricarpos.
    Berry red or black, few to several-seeded; corolla tubular, commonly irregular and gibbous at base; stamens 5 ..... 5. Lonicera.

1. SAMBÙCUS L. Elderberry

Deciduous shrubs or small trees. Leaves compound, odd-pinnate, with serrate leaflets. Flowers small, white, in a terminal compound cyme, jointed with their pedicels. Calyx 5-toothed. Corolla regular, rotate, deeply 5-lobed. Ovary 3 to 5-celled; style short; stigmas 3 to 5; ovules solitary, suspended from the summit of each cell. Fruit a small berry-like drupe, containing 3 to 5 cartilaginous nutlets. (Greek sambuke, a musical instrument, made of Elder wood.)

Cymes flat-topped; berry blue with a bloom; winter buds small.
  Leaves glabrous, the leaflets commonly equal-sided at base ..... 1. *S. glauca.*
  Leaves finely pubescent beneath, the leaflets unequal-sided at base ..... 2. *S. velutina.*
Cymes dome-shaped or thyrsoid; berry red; winter buds large with large scales .....
  3. *S. racemosa.*

1. **S. gláuca** Nutt. BLUE ELDERBERRY. Fig. 898. Roughish thickety bush 6 to 10 ft. high, or eventually developing into a small tree with distinct trunk, up to 25 ft. high; leaves glabrous; leaflets 5 to 7, ovate to oblong-lanceolate, serrate except at the abruptly acuminate apex, 1 to 3½ in. long; cymes flat-topped, 2 to 6 or 9 in. broad; flowers white, 2½ to 3½ lines broad; berries 2 to 3 lines in diameter, blue beneath the white bloom. —Open woods, cañons or moist flats of the lower hill country or middle altitudes, and along stream-banks in the valleys, 10 to 5400 ft.: throughout cismontane Cal.; n. to B. C., e. to Utah. May-Aug., fr. Aug.-Sept. (S. coerulea Raf.) Var. ARIZÓNICA Sarg. Leaves 3 (or 5)-foliolate; leaflets elliptic, acuminate, glabrous or puberulent.—Stream-banks: coastal S. Cal.; Kern Co.; e. to N. Mex. (S. mexicana Sarg.)

898. Sambucus glauca Nutt.; *a*, fl. branchlet x ¼; *b*, fl. x 4½.

2. **S. velùtina** D. & H. Shrub or small tree 6 to 15 ft. high; branchlets densely short-pubescent or sometimes glabrous; leaves thick or coriaceous, finely and often densely short-pubescent, especially beneath, or sometimes glabrous; leaflets 5 to 7 or 9, thickish or coriaceous, oblong-ovate, abruptly attenuate at apex, finely serrate, one side continued farther down the petiolule than the other and so very unequal at base, 3 to 6 (or 8) in. long, the lower leaflets not infrequently with a supplementary leaflet; cymes flat-topped, 4 to 8 or 16 in. broad; flowers yellowish; berries black with a bloom, 1 to 1½ lines in diameter.—Dry open slopes, 3000 to 8000 ft.: Sierra Nevada; mts. of S. Cal. Aug. (S. mexicana Trees of Cal.)

3. **S. racemòsa** L. Thick spreading bush 1 to 3 (or 4) ft. high; leaves thin, glabrous or nearly so; leaflets 5, ovate to elliptic, equal-sided at base, narrowed at apex to a slender entire point, serrate, 1½ to 3 (or 5) in. long; cymes round-ovate, 1¼ to 3 in. high; flowers cream-color; berries red, 2½ lines in diameter.—Moist places and especially margins of surface streams on mountain slopes, 7000 to 10,500 ft.: Sierra Nevada from Tulare Co. to Placer Co.; n. to B. C., e. to Atlantic and Eur. July. Var. CALLICÀRPA Jepson. Fig. 899. Low shrub or small tree 8 to 14 or 20 ft. high; leaves thinnish, pubescent beneath and often above with short appressed hairs; leaflets thinnish, oblong-ovate or obovate, acuminate, sharply serrate to the very apex, 2 to 7 in. long; berries scarlet, without bloom, 2 lines broad; fruiting clusters 2 to 5 in. across, very showy.—Cañon beds or flats along the coast: San Mateo Co. to Humboldt Co.; n. to Wash. (S. callicarpa Greene.)

899. Sambucus racemosa var. callicarpa Jepson; *a*, fl. branchlet x ⅓; fl. x 1¼.

2. VIBÚRNUM L.

Shrubs with simple leaves. Flowers white, in a terminal compound cyme, jointed on the pedicels. Cyme in ours peduncled, with 5 to 7 primary rays.

Calyx-limb 5-parted. Corolla deeply saucer-shaped, 5-lobed. Stamens 5. Ovary 1-celled with 1 ovule. Fruit a drupe with a flattened stone, which (in ours) is broadly sulcate on both faces. (Latin name of the Wayfaring Tree.)

1. **V. ellípticum** Hook. Slender deciduous shrub 4 to 12 ft. tall; herbage minutely pubescent and a little glandular; leaves orbicular or elliptical, dentate except at base, 3 to 5-nerved from the base, 1 to 2½ in. long; petioles 3 to 6 lines long; cymes ¾ to 1 in. high; corolla 3 to 4 lines broad; fruit black, oval, nearly ½ in. long; stone with 2 grooves on one face and 3 on the other (the median groove divided by a longitudinal ridge), 4 to 5 lines long.—Cañons, 1000 to 4200 ft.: Sonoma Co. to Humboldt Co.; Eldorado Co.; n. to Wash. Apr.-June.

3. LINNAÈA L.

Creeping somewhat woody little evergreen herb with opposite leaves. Flowers nodding, pink or purplish, borne in pairs at the forked summit of thread-like upright peduncles. Calyx-teeth 5, subulate, deciduous. Corolla white, tinged with pink, slender bell-shaped to funnelform, regular, 5-lobed. Stamens 4, two of them shorter, inserted near the base of the corolla-tube. Ovary 3-celled, 2 of the cells with several abortive ovules, the third with a perfect ovule. Fruit a dry 3-celled pod with one seed. (Named by Gronovius for Linnaeus.)

1. **L. boreális** L. var. **americàna** Rehder. Stems slender, trailing, ½ to 1 ft. long; peduncles erect, 2½ in. long; leaves oval, serrate above the middle, 6 to 9 lines long, on petioles 1 line long; corolla ½ in. long.—Montane, 2500 to 8400 ft.: Humboldt and Trinity Cos. to Plumas and Modoc Cos.; n. to arctic circle.

4. SÝMPHORICÁRPOS L. Waxberry

Low branching bushes. Leaves small, simple, short-petioled, deciduous. Flowers 2-bracteolate, white or rosy-tinged, in close short spikes or clusters. Calyx with a globular tube and 4 or 5-toothed limb; limb short, persistent. Corolla regular, open-campanulate or tubular-funnelform, 4 or 5-lobed, the stamens inserted on its throat, in ours included. Ovary 4-celled, each of the 2 lateral cells with a single fertile ovule, the two median cells containing several ovules, none of which develop. Fruit a white berry with bony seeds. (Greek sumphoreo, to bear together, and karpos, fruit, the berries in close clusters.)

900. Symphoricarpos albus Blake; *a*, fl. branchlet x 1; *b*, long. sect. of fl. x 3½; *c*, fr. cluster x 1.

Corolla deeply bowl-shaped, 2 to 3 lines long.
Leaves nearly glabrous, mostly 1 in. long, entire or lobed . . . . . 1. *S. albus.*
Leaves densely soft-pubescent, mostly ½ in. long, commonly entire . . . . . 2 *S. mollis.*
Corolla tubular- to oblong-campanulate, 3 to 6 lines long.
Style glabrous . . . . 3. *S. rotundifolius.*
Style bearded . . . . . 4. *S. longiflorus.*

1. **S. álbus** (L.) Blake. Snow Berry. Fig. 900. Erect or spreading shrub with slender branches, 2 to 4 (or 6) ft. high; leaves round-oval to ovate or oblong, entire or on the same branchlet sinuately few-toothed or saliently lobed, glabrous or the lower surface pubescent, commonly 1 (less commonly as much as 2) in. long, short-petioled; calyx-lobes ciliate; corolla pinkish, distended on the lower side, 2 lines long, 5-lobed above the middle.

densely villous-hirsute within; berry globose, 4 to 6 lines in diameter; pulp snowy, nearly tasteless.—Foothills, 10 to 2000 ft.: Coast Ranges; Sierra Nevada foothills; n. to B. C., e. to N. Eng. and Pa. May-June. (S. racemosus Michx.) The leaves of sterile shoots are very variable in size, shape, toothing and lobation.

2. **S. móllis** Nutt. Low diffuse shrub about 1 ft. high, of somewhat more delicate habit than the preceding and with thinner leaves; leaves oval or elliptic, on the fertile shoots mostly ½ in. long and seldom other than entire, pubescent on both surfaces or more so on the lower surface; corolla whitish or rose-red, barely pubescent within, otherwise like the last. Montane slopes, 5000 to 8400 ft., or near the coast down to 600 ft.: mts. of S. Cal.; Sierra Nevada; Coast Ranges; n. to Wash. Apr.-May.

3. **S. rotundifòlius** Gray. Straggling shrub 1 to 3¼ ft. high; herbage finely pubescent to glabrate; leaves orbicular or ovate to oblong-elliptical, obtuse or more commonly acutish at both ends, 5 to 10 lines long; flowers in pairs at the upper nodes, nodding; corolla tubular-campanulate, white, yellowish or pink-tinged, 3 to 5 lines long, the tube pubescent within below the stamens, 3 to 4 times the length of the broad lobes; style glabrous; nutlets of the berry oblong, obtuse at both ends.—High montane, 6000 to 10,000 ft.: inner North Coast Range from Mendocino Co. to Siskiyou Co.; Sierra Nevada from Modoc Co. to Tulare Co., thence sw. to the San Gabriel, San Bernardino and San Jacinto mountains; e. to N. Mex. (S. parishii Rydb. S. parvifolius Eastw.) Var. OREÓPHILUS Jones. Diffuse bush 1 to 4 ft. high, minutely pubescent, indistinguishable from the species by any constant character unless it be that of the nutlets which are acutely pointed at base.—Montane, 6300 to 9000 ft.: high easterly flats or east slopes of the Sierra Nevada from Mono and Mariposa Cos. to Lake Tahoe; e. to Col. (S. oreophilus Gray.)

4. **S. longiflòrus** Gray. Similar to no. 3; leaves very glaucous; corolla 5 to 6 lines long, glabrous within; style long hairy.—Mohave Desert and Inyo Co.; e. to Utah.

5. LONÍCERA L. HONEYSUCKLE

Erect or twining shrubs with simple entire leaves, one or two pairs beneath the inflorescence often connate-perfoliate. Flowers spicate at the ends of the branches or in small axillary clusters. Calyx-limb 5-toothed or truncate, deciduous or persistent, mostly small, sometimes none. Corolla 5-lobed and nearly regular, or strongly 2-lipped with 4 lobes in the upper lip and one lobe in the lower lip, its tube more or less gibbous at base. Stamens 5, inserted on the tube of the corolla. Ovary ovoid or almost globose, 2 or 3-celled, becoming a few- to several-seeded berry. (Adam Lonitzer, a German herbalist of the 16th century.)

Erect deciduous shrubs; flowers borne in pairs on a common peduncle in the leaf axils.
- Ovaries and berries of the pair distinct.
  - Ovaries not enclosed in a sac.
    - Corolla yellow or reddish, nearly regular, its lobes ⅛ to ⅙ length of tube... 1. *L. involucrata.*
    - Corolla white, strongly 2-lipped, its lobes as long as tube.....2. *L. utahensis.*
  - Ovaries of the pair seemingly connate but really enclosed in an urnshaped sac and appearing to form a single berry.....3. *L. coerulea.*
- Ovaries and berries of the pair connate; corolla nearly black.....4. *L. conjugialis.*

Twining or trailing shrubs; flowers sessile, in whorls.
- Leaves ciliate, otherwise glabrous, deciduous.....5. *L. ciliosa.*
- Leaves not ciliate, evergreen; flower-whorls in terminal interrupted spikes.
  - Leaves all distinct; corolla yellow, pubescent.....6. *L. subspicata.*
  - Leaves next the inflorescence united into a connate-perfoliate disk.
    - Corolla yellow, glabrous without; leaves without stipule-like appendages.... 7. *L. interrupta.*
    - Corolla pink, hispidulous-glandular without; leaves with stipule-like appendages .....8. *L. hispidula.*

1. **L. involucràta** Banks. Low upright shrub 2 to 3 ft. high; leaves ovate, more or less abruptly attenuate at apex, hairy-pubescent beneath, 1½ to 3 or 5 in. long, on short petioles; peduncles 6 to 8 (or 12) lines long, the flowers subtended by large and conspicuous broad bracts which become reddish in age; corolla clear yellow, viscid-pubescent, 6 to 8 lines long, its spreading lobes subequal, about 1 line long, its tube saccate-gibbous at base; tips of

901. Lonicera involucrata var. ledebourii Jepson; *a*, fl. branchlet x ⅔; *b*, long. sect. of fl. x 1; *c*, cross-sect. of ovary x 3⅓.

anthers exserted; style puberulent; berries black, 3 to 5 lines in diameter, disagreeable to the taste. — Montane, 6500 to 9500 ft.: Sierra Nevada from Tulare Co. to Tuolumne Co.; n. to B. C. Var. LÈDEBOÙRII Jepson n. comb. Fig. 901. Erect, 4 to 7 ft. high; bracts crimson in age; corolla dull yellow or reddish-tinged, its tube saccate at base; anthers included. — Cañon bottoms and river flats, Coast Ranges near the sea from Santa Barbara to Humboldt Co. Mar.-June. (L. ledebourii Esch.)

2. **L. utahénsis** Wats. Spreading shrub 3 to 5 ft. high; leaves green, the glaucescence scarcely perceptible, oblong-ovate, commonly cordate at base, glabrous or rarely obscurely ciliate towards the base, 1 to 2¼ in. long, shortly petioled; flowers in pairs on axillary peduncles, the peduncles 6 to 9 lines long, longer than the flowers; bracts narrowly linear, as long as the ovaries; bractlets round, minute; corolla pure white, fading in age to a pale salmon-yellow, glabrous; tube 3 to 4 lines long, somewhat saccate on one side at base, the sac marked with pink; corolla-lobes oblong, about as long as the tube, those of the upper lip and that of the lower lip not unlike in shape and scarcely at all in size but strongly 2-lipped as to position of the lobes; middle lobes of upper lip not so deeply parted from each other as from the lateral ones; adnate portion of filaments slightly hairy; ovaries divergent; berries red.— Wooded slopes, 2700 ft.: Siskiyou Co.; n. to B. C., e. to Utah.

3. **L. coerùlea** L. Low, 1 to 2 ft. high; leaves thin, ovate to ovate-oblong, 1 to 1½ in. long; peduncles 1 or 2 lines long, much shorter than the flowers; corolla yellowish, funnelform, rather deeply lobed but little 2-lipped; ovaries distinct but tightly enclosed by the sac-like united bractlets or cupula which becomes juicy in fruit, so that the whole looks like a single globular black berry.—Montane, 7000 to 8000 ft.: Sierra Nevada from Tulare Co. to Mariposa Co.; n. to Alas.; Eur., Asia.

4. **L. conjugiàlis** Kell. Fig. 902. Slender shrub 2 to 5 ft. high; herbage with short spreading pubescence; leaves mostly oblong-obovate, 1 to 2¼ in. long, on petioles only 1 or 2 lines long; peduncles 8 to 10 lines long; bracts minute; corolla black-purple, 3 to 4 lines long, strongly 2-lipped, the tube gibbous below the lower lip; upper lip erect, shallowly 4-toothed; lower lip deflexed, oblong, entire; throat of corolla filled with soft white hairs, the lower part of filaments and of style also white-hairy; ovaries about ⅔ joined; berries red, the pair transversely oblong, 5 to 6 lines broad and about 3 lines long.—Montane, 6200 to 9500 ft.: n. Humboldt Co.; Sierra Nevada from Tulare Co. to Modoc Co.; n. to Wash., e. to western Nev. July; fr. Sept.

902. Lonicera conjugialis Kell.; fl. branchlet x 1.

5. **L. ciliòsa** Poir. Low, trailing along the ground, the stems 1 to 2 or 10 ft. long; leaves oval or ovate, mostly obtusish, green above, very glaucous beneath, glabrous except the ciliate margin, 2½ to 4 in. long, on petioles ½ to 3 lines long; flowers in a single terminal whorl (rarely 2 or 3), the whorl sessile or shortly peduncled; corolla red to yellow, slightly 2-lipped, 8 to 14 lines long, its tube swollen or ventricose below.—Montane, 2500 to 4000 ft.:

Humboldt Co. to Siskiyou Co., thence se. to Butte Co.; n. to B. C., e. to Mont. June-July.

6. **L. súbspicàta** H. & A. MORONEL. Woody-based but climbing or reclining on shrubs and attaining a height of 3 to 8 ft. or sometimes a distinct erect shrub 4 to 6 ft. high; leaves oblong or oval to ovate, short-petioled, coriaceous, lightly or densely pubescent beneath and often glandular, ¾ to 1 (or 1½) in. long, all distinct, the uppermost pair rarely connate; inflorescence often paniculate, the whorls 2 to 6-flowered; corolla pale yellow, pubescent, 4 to 6 lines long, its lips coiling or recurved, the stamens exserted; berries red or yellow.—Chaparral slopes, 100 to 5500 ft.: cismontane S. Cal.; n. in the South Coast Ranges to Mt. Diablo; Tehachapi Mts.

7. **L. interrúpta** Benth. CHAPARRAL HONEYSUCKLE. Plant with a rigid woody trunk 1 ft. or so high, the branches climbing or reclining on bushes; leaves orbicular to elliptic-oblong or -ovate, green above, glaucous beneath, ¾ to 1 in. long, on petioles 1 to 3 lines long, mostly without interfoliar appendages; spikes 2 to 5 in. long, peduncled, terminal and solitary or with several additional from the axils of the uppermost leaves, 1 to 3 pairs of which are connate-perfoliate; corolla cream-yellow, 4 to 5 lines long, glabrous exteriorly, nearly glabrous within; filaments hairy towards the base; berries red. — Dry slopes and ridges, 1500 to 4000 ft.: middle and inner Coast Ranges; Sierra Nevada; s. to the San Gabriel and San Bernardino mountains; e. to Ariz.

903. Lonicera hispidula var. californica Jepson; *a*, fl. branchlet x ⅓; *b*, fl. x 1¼; *c*, fr. x 1¼.

8. **L. hispídula** Dougl. var. **californica** Jepson. Fig. 903. CALIFORNIA HONEYSUCKLE. Stems slender, ¼ to ½ in. in diameter, climbing bushes or trees 6 to 20 ft. high; leaves oblong, ovate, or elliptic-oblong, truncate or subcordate at base, green above, white-glaucous below, 1½ to 3 in. long, short-petioled; uppermost leaves connate-perfoliate, the others except the lowest with connate-perfoliate stipule-like (often conspicuous) appendages; spikes very glandular, especially in fruit; corolla pink, 6 to 8 lines long, glandular-hispidulous without, the tube within and the lower portion of the filaments very hairy; berries scarlet.—Cañons and along streams in the foothills, 100 to 2000 ft.: Sierra Nevada foothills; Coast Ranges; rare in S. Cal. July-Aug.

DIPSÀCEAE. TEASEL FAMILY

Herbs with opposite leaves. Flowers in dense heads or short spikes surrounded by an involucre. Calyx-tube adnate to the ovary, its limb cup-shaped or divided into bristles. Corolla borne on the calyx-limb, with 4 or 5-lobed limb. Stamens 4 (or 2 by abortion), inserted on the throat of the corolla; filaments exserted. Ovary 1-celled; style filiform; ovule 1. Fruit an achene, crowned with the persistent calyx.

Bracts of the spike or head conspicuous, rigid, prickly-pointed, exceeding the flowers. . . . . 1. DIPSACUS.

Bracts of the head herbaceous, inconspicuous, concealed among the flowers. . . . 2. SCABIOSA.

1. DÍPSACUS L.

Stout coarse and prickly biennial herbs. Cauline leaves united at base. Flowers pinkish white, in a dense oblong head or short spike, surrounded by

an involucre of elongated bracts much surpassing the pointed bracts subtending the flowers. Bracts in fruit very rigid and spine-like. Calyx-limb cup-shaped, 4-toothed. Corolla 4-lobed. Achene surrounded by a 4 to 8-ribbed involucel. (Greek name of the Teasel.)

1. **D. fullònum** L. FULLER'S TEASEL. Erect, 4 to 5 ft. high; basal leaves broadly oblong, arcuate, 1¼ ft. long or less; upper cauline connate-perfoliate: spikes 3 or 4 in. long; bracts of the involucre narrowly linear, tapering to the acute apex, 1 to 4 in. long; bracts of the spike with recurved tips.—Nat. from Eur. in low waste lands, especially near the coast.

2. SCABIÒSA L.

Large herbs with opposite leaves and the flowers in hemispherical heads on long peduncles. Involucre of many distinct bracts. Involucel cylindrical, not lobed. Calyx-tube adnate to the ovary, produced slightly beyond it and bearing 5 long slender awns. Corolla inserted on the summit of the calyx-tube, slender-funnelform or salverform, with 5 short equal lobes, the marginal corollas much larger with the upper lobes much smaller than the lower. (Latin scabiosa, meaning scurfy, the plant used for affections of the skin.)

1. **S. átropurpúrea** L. MOURNING BRIDE. Stems branching, 2 to 3 ft. high; lowest leaves lyrate; upper leaves pinnately divided or the uppermost oblong-lanceolate and coarsely serrate or the narrower ones disposed to be entire; peduncles 8 to 12 in. long; heads 1½ in. broad; flowers black-purple to pinkish white, the regular corollas 5 or 6 lines long; calyx-awns 3 lines long; fruit an achene, enclosed in the persistent involucre and bearing the exserted calyx-awns.—Native of Eur., naturalized by waysides: Sacramento Valley; Napa Valley; Alameda Co.; San Bernardino Co.

VALÈRIANÀCEAE. VALERIAN FAMILY

Herbs with opposite leaves. Flowers mostly perfect, borne in a cymose inflorescence. Corolla epigynous, 2-lipped to regularly 5-lobed, the 1 to 3 stamens borne on its tube. Calyx-tube adnate to the ovary, its limb obsolete or in one species pappus-like. Ovary commonly 3-celled, the two lateral cells reduced to mere nerves, or enlarged and forming wings to the central cell which in fruit is 1-seeded and indehiscent. Style simple, slender; stigmas 1 to 3.

Perennials; limb of calyx-tube pappus-like.....1. VALERIANA.
Annuals; limb of calyx-tube obsolete.....2. PLECTRITIS.

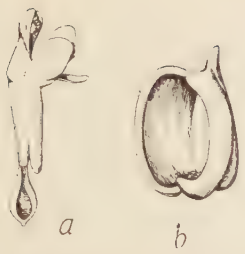
1. VÁLERIÀNA Tourn.

Perennial herbs. Calyx-limb of 5 to 15 bristle-shaped lobes, which are coiled up and inconspicuous until the fruiting stage when they unroll and form a conspicuous plumose and pappus-like crown to the fruit. Corolla campanulate-funnelform to salverform, the tube often gibbous or slightly saccate anteriorly. Stamens 3. Ovary 1-celled, with mere vestiges of 2 lateral cells, ripening into a flattened achene. Roots with a peculiar scent. (Mediaeval Latin name.)

1. **V. sylvàtica** Banks. Stems erect, simple, from rootstocks; herbage more or less puberulent; basal leaves mainly undivided, obovate; cauline leaves pinnate or pinnately divided, with 3 to 13 leaflets; corolla white or pinkish, 2 to 3 lines long, the tube short.—Wet places in pine woods, 8000 to 10,000 ft.: Sierra Nevada from Tulare Co. to Nevada Co. and n. to Siskiyou Co. Var. GLÀBRA Jepson n. var. Herbage glabrous.—Hockett Mdw., Tulare Co. (Culbertson, type); Jackson Lake, Siskiyou Co.

2. PLECTRÌTIS DC.

Annuals with glabrous herbage. Stems angled, simple or with slender branches. Leaves entire or sparingly toothed, the cauline commonly sessile. Flowers small (1 to 2½ lines long), borne in glomerules at the end of the stem or branches, or the glomerules in interrupted or dense spikes. Fruit winged, except in one species, the wings incurved and forming a circular hollow on the ventral side.—Species similar in size, habit, leaves and inflorescence. (From Latin plecto, to plait or interweave, on account of the involved inflorescence.)



904. Plectritis macrocera T. & G.; *a*, fl.; *b*, fr. x 5.

Fruits wingless.....1. *P. samolifolia.*
Fruits winged.
Fruits hispid, pubescent or glabrous, not woolly.
Spur rather short, not prolonged below the ovary; back of fruit hispid, pubescent or glabrous.....2. *P. macrocera.*
Spur prolonged below the ovary; fruit with a row of short equal bristles bordering the ribbon-like carina and perpendicular to it. 3. *P. ciliosa.*
Fruits very woolly.....4. *P. jepsonii.*

1. **P. sámolifòlia** (DC.) Hoeck. Corolla obscurely 2-lipped; spur short; fruit triangular, wingless, hispid or glabrous, about 1 line long.—Coast Ranges near the coast from Santa Cruz Co. to Humboldt Co., thence e. to Shasta Co.

2. **P. macrócera** T. & G. Fig. 904. Slender, simple or branched, 3 to 15 in. high; leaves linear, ovate or oblong; spur of corolla equaling or somewhat exceeding tube; fruit hispid to nearly glabrous, dorsally carinate; wings broad, more or less lobed at apex, spreading or incurved, the margins often grooved and often ciliate.—Common and widely distributed in the foothills and middle altitudes of the mountains: Monterey Co. to Siskiyou Co., thence se. to Butte Co. It is very variable, especially in pubescence of fruit.

3. **P. ciliòsa** Jepson n. comb. Fig. 905. Slender, 3 to 12 in. high; corolla small, distinctly 2-lipped, deep pink, very long; keel broad, ribbon-like, glabrous or hispidulose, densely and regularly ciliate along both margins.—San Diego Co.; northw. through the Coast Ranges and Sierra Nevada to Tehama Co. (Valerianella ciliosa Greene. P. davyana Jepson.)

906. P. jepsonii Davy; fr. x 8.

905. Plectritis ciliosa Jepson; *a*, habit x ⅔; *b*, fl. x 4; *c*, dorsal view of fr. x 6½; *d*, ventral view of fr. x 6½.

4. **P. jepsónii** Davy. Fig. 906. Stem simple, about 10 in. high; fruit conspicuously covered with woolly hairs; incurved margin of wing thickish, marked lengthwise on the outside by a groove.—Foothills of the Vaca Mts.

CAMPÁNULÀCEAE. Bell-flower Family

Slender or small herbs with milky juice, alternate simple leaves and regular complete flowers. Calyx-tube adnate to the ovary, the limb commonly 5-parted, usually divided down to the ovary and persistent. Corolla 5-lobed or -parted, inserted with the 5 stamens where the calyx becomes free from the ovary. Ovary 2 to 5-celled; style 1, long, with 2 to 5 stigmas. Fruit a many-seeded capsule.

Capsule dehiscent on the side or close under the calyx; leaves mostly broad (narrow in Campanula uniflora).
Capsule opening by small valves or circular perforations.
Corolla more or less campanulate; ovary short and broad.....1. Campanula.
Corolla rotate; ovary somewhat elongated.....2. Specularia.
Capsule opening by irregular fissures; ovary short and broad.....3. Heterocodon.
Capsule dehiscent at the apex within the calyx; ovary club-shaped; leaves mostly narrow. 4. Githopsis.

1. CAMPÁNULA L. Bell-flower

Herbs with blue flowers. Calyx with 5 narrow lobes, its tube short and broad. Corolla campanulate or nearly so. Filaments dilated at base. Stigmas and cells of the ovary 3 to 5. Capsule short, opening on the side or close under the calyx by 3 to 5 small valve-like perforations. (Diminutive of Latin campana, a bell.)

Style longer than corolla; capsule openings near the middle or base; perennials.
Stem leaves sessile or on very short petioles; corolla lobes narrowly lanceolate . . . . . 1. *C. prenanthoides.*
Stem leaves on petioles at least ½ as long as blade; corolla lobes ovate-oblong . . . . . 2. *C. scouleri.*

Style not longer than corolla.
Annual, diffusely branched from base; capsule urnshaped, the openings just above the middle; on peaks near the coast . . . . . 3. *C. exigua.*
Perennials.
Stems 2 to 5 in. high from a branched root-crown; capsule oblong-turbinate, the openings near the summit; montane species . . . . . 4. *C. uniflora.*
Stems ½ to 2 ft. high from a slender rootstock; capsule globular to obconic, the openings near the middle or base.
Stem leaves linear or lanceolate, entire; montane species . . . 5. *C. rotundifolia.*
Stem leaves oval or ovate-oblong, crenate; coast species . . . . 6. *C. linnaeifolia.*

907. Campanula prenanthoides Dur.; *a*, leaves x ½; *b*, fl. stem x ½; *c*, long. sect. of fl. x 1½.

1. **C. prenánthoides** Dur. California Hare-bell. Fig. 907. Stem slender, erect, 1½ to 2 ft. high, often much branched; herbage minutely rough-puberulent or almost glabrous; leaves oblong-ovate or lanceolate, sessile, or short-petioled, ½ to 1½ in. long, sharply serrate; flowers mostly in clusters on short pedicels; clusters axillary, or the upper leaves reduced and the inflorescence racemose; corolla cylindrical in the bud, 4 to 5 lines long, 2 to 3 times the length of the subulate calyx-lobes, parted into linear-lanceolate lobes; capsule hemispherical or short-turbinate. — Wooded slopes, 800 to 6000 ft.: near the coast, from Monterey Co. to Siskiyou Co.; Sierra Nevada from Tulare Co. to Shasta Co.; n. to southern Ore. July-Aug.

2. **C. scoùleri** Hook. Stem slender, erect, or decumbent at base, mostly simple, 6 to 12 in. high; herbage glabrous; leaves ovate to lanceolate, sharply serrate, ¾ to 1¼ in. long, tapering at base into a margined petiole at least ½ as long as blade; flowers on filiform peduncles, solitary in the axils or terminal, or the upper leaves reduced to minute bracts and the inflorescence paniculate; corolla exceeding or twice as long as the subulate calyx-lobes, deeply cleft into ovate-oblong lobes.—Montane, 1500 to 5000 ft.: Humboldt Co. to Siskiyou Co., thence se. in the Sierra Nevada to Sierra Co.; far n. to Alas.

3. **C. exígua** Rattan. Stem branching from the base and diffuse, 2 to 4 (or 6) in. high, short-hispid, especially at base; leaves obovate, linear, or the uppermost subulate; flowers erect, lateral or terminal on the branchlets, of two kinds, one with slender and rather short style having 3 revolute stigmas at apex and with the dilated bases of the filaments not ciliolate; the other kind with the style longer, conspicuously club-shaped and merely notched at apex, the dilated bases of the filaments ciliolate; corolla of both kinds light blue, 2 to 4 lines long; calyx-lobes subulate-linear, nearly twice the length of the turbinate tube; capsule somewhat urnshaped, with 3 valve-like open-

ings just above the middle.—Coast Range peaks and ridges, 2000 to 4000 ft.: Mt. Hamilton; Mt. Diablo; Mt. Tamalpais; Mt. St. Helena.

4. **C. uniflòra** L. Stems 1 or more from the branched root-crown, 1½ to 5 in. high, the larger ones 2 to 4-flowered; herbage puberulent to glabrous; leaves thickish, the basal spatulate, 6 to 8 lines long, the upper cauline linear; corolla 4 to 6 lines long, the ovate-lanceolate lobes as long as the campanulate tube; capsule oblong-turbinate, not narrowed at summit.—Scott Mts., Siskiyou Co.; n. to Alas., e. to Col. and Lab.; Eur., Asia. Aug. (C. scabrella Engelm.)

5. **C. rotúndifòlia** L. Stems diffuse or erect, from slender or filiform root-stocks, ½ to 2 ft. high, 1 to 9-flowered; lowest leaves orbicular or ovate to cordate, minutely serrate, slender-petioled; cauline leaves linear, entire, sessile, 1½ to 2½ in. long; flower-buds erect on slender pedicels; flowers drooping or spreading; calyx-lobes subulate, spreading, longer than the short-turbinate tube; corolla blue, campanulate, 6 to 9 lines long; capsule obconic or ovoid, nodding, opening by short clefts near the base.—Montane, 5000 to 8000 ft.: Trinity and Siskiyou Cos.; n. to Alas., e. to Allegheny Mts.; Eur. July-Sept.

6. **C. linnaèifòlia** Gray. Stem slender, simple or sparingly branched at summit, 4 to 12 in. high; leaves ovate-oblong, crenulate except at base, sessile or subsessile, 6 to 11 lines long, the margins retrorsely scabrous, as also the angles of the stem; flowers few, the peduncles as long or much longer; calyx-lobes lanceolate; corolla pale blue, 6 to 7 lines long; capsule globular.—Swampy places along the coast line: Pt. Reyes to Mendocino Co. June-July.

2. SPECULÀRIA Heister. Venus Looking-glass

Annuals with leafy stems. Flowers solitary or in clusters, sessile in the axils of the leaves, blue or purplish, 1 or 2-bracteolate. Our species with two kinds of flowers: the earlier fertilized in the bud, with undeveloped corolla and 3 or 4 calyx-lobes; the later with a conspicuous blue corolla and 5-lobed calyx. Corolla rotate or nearly so. Stigmas and cells of the ovary 3, sometimes 2 or 4. Capsule dehiscent by 2 or 3 small valve-like openings. (Latin speculum, a looking-glass.)

Leaves ovate; sessile; openings of the capsule close under the calyx.....1. *S. biflora.*
Leaves round-cordate, clasping; openings of the capsule at or below the middle.....
2. *S. perfoliata.*

1. **S. biflòra** (R. & P.) Gray. Stems slender, simple or with many branches from the base, 8 to 15 in. high, retrorsely scabrous-hispidulous on the angles; internodes rather short; leaves ovate, mucronate, sessile, entire or somewhat crenate, 3 to 6 (or the lowermost 8 or 9) lines long; corolla blue, exceeding the linear-lanceolate calyx-lobes; capsule prismatic or cylindric, 3 to 4 lines long, sessile, the valve-like openings close under the calyx.—Low open hills or valley fields, 200 to 4000 ft.: coastal S. Cal.; Coast Ranges; Great Valley; Sierra Nevada; n. to Ore., e. to Va. and Fla., s. to Mex.; n. S. Am.

2. **S. pérfoliàta** A.DC. Stems commonly stouter than in S. biflora, simple or branched from the base, 8 to 20 in. high, very leafy throughout, hirsute or hispid on the angles; leaves round-cordate, crenate, clasping, veiny, 3 to 8 lines long; corolla blue, usually equaled by the calyx-lobes; calyx-lobes of the close-fertilized flowers short, of the later flowers as long as the ovary; capsule oblong or somewhat obconical, 2 to 4 lines long, the 2 or 3 valve-like openings at or below the middle; seeds lenticular.—Open ground and fields, 200 to 3000 ft.: Humboldt Co.; n. to B. C., e. to the Atlantic. June-July.

3. HÉTEROCÒDON Nutt.

Delicate annual with solitary axillary flowers of two kinds as in Specularia. Calyx-lobes of the earlier flowers 3 or 4, of the later 5 (when 4 or 5 one or two smaller), all foliaceous and much longer than the obpyramidal tube. Corolla open-campanulate. Capsule short and broad, 3-celled, 3-lobed, bursting by mostly irregular lengthwise fissures in the thin spaces between the ribs. (Greek heteros, different, and kodon, bell, the flowers campanulate and of two different kinds.)

1. **H. rariflòrum** Nutt. Stems filiform, 1½ to 9 (or 16) in. high; leaves roundish, 1½ to 5 lines long, sessile, truncate or subcordate at base, sharply toothed, the teeth bristle-pointed and the margin between the teeth frequently ciliate-bristly; calyx sparsely hispid, its lobes ovate, sparingly toothed, 1 to 3 lines long; corolla of earlier flowers scarcely evident, of the later flowers well developed, light blue (the short lobes darker), the tube 1½ to 2 lines long.—Wet places and open fields, 300 to 5500 ft.: San Jacinto and San Bernardino mountains; Tehachapi Mts.; Sierra Nevada from Tulare Co. to Modoc Co.; Coast Ranges from Alameda Co. to Siskiyou Co.; n. to B. C. and Ida., e. to Nev. Apr.-June.

4. GITHÓPSIS Nutt.

Small annuals with blue flowers terminating the stems or branches. Calyx-tube cuneate, strongly 10-ribbed, adnate up to the summit of the ovary, with 5 linear foliaceous lobes. Corolla tubular-campanulate. Filaments short, dilated at the base; anthers long and linear. Ovary 3-celled; stigma 3-lobed. Capsule clavate, coriaceous, crowned with rigid calyx-lobes of its own length, strongly striate-ribbed, many-seeded, dehiscing at apex by a perforation at the place where the style falls away. (Name from Githago, the calyx resembling that of the Corn-Cockle.)

Calyx-lobes equaling or longer than capsule; upper leaves 3 to 5 lines long..... 1. *G. specularioides.*
Calyx-lobes shorter than capsule; none of the leaves over 2 lines long.....2. *G. diffusa.*

908. Githopsis specularioides Nutt.; *a*, *b*, two kinds of fls. x 1.

1. **G. speculàrioides** Nutt. Fig. 908. Stem simple or with 1 to several proliferous branches, these in turn sometimes proliferous, 4 to 7 in. high; herbage retrorsely rough-pubescent; upper leaves oblong, or narrower, 3 to 5 lines long, the lowermost obovate, 1 to 2 lines long, all sharply few-toothed; calyx-lobes 3 to 8 lines long, eventually callous-ribbed, shorter than or 3 to 4 times as long as the corolla; corolla-lobes shorter than the tube; capsule rigid, tapering into a short and stout peduncle.—Open ground in hill country, 200 to 4000 ft.: coastal S. Cal.; Coast Ranges from Santa Clara Co. to Humboldt Co.; Sierra Nevada from Mariposa Co. to Plumas Co.; n. to Wash. Var. GLÀBRA Jepson n. var. Glabrous or nearly so; sinuses of the calyx hispidulous.—Amador Co. (Antelope, Hansen 494, type); Humboldt Co.

2. **G. diffùsa** Gray. Stems slender, weak, diffusely branched, 2 to 6 in. long; herbage glabrous; leaves small and scale-like, almost lacking on the upper portions of the stem; calyx-lobes lanceolate, shorter than the capsule; corolla blue, 2 lines long.—San Diego.

LOBELIÀCEAE. Lobelia Family

Herbs, mostly annuals, with alternate simple entire leaves. Flowers in racemes, complete. Calyx-tube adnate to the ovary, its free border with 5 distinct lobes or teeth. Corolla epigynous, 2-lipped, 2 lobes in the upper lip and 3 in the lower. Stamens 5, inserted with the corolla, but generally free from it and alternate with its lobes; anthers and filaments usually united into a tube about the style. Ovary inferior, 2-celled; style 1; stigma capitate and girt with a rim of hairs. Juice mostly milky and acrid. Fruit in ours a many-seeded 1 or 2-celled capsule.—Flowers in capitate clusters in Parishella and corolla rotate. Ovary partly or wholly free in Nemacladus.

Anthers distinct; flowers minute.
  Flowers solitary on filiform pedicels borne on zig-zag stems; stems erect. 1. Nemacladus.
  Flowers subsessile in capitate clusters; stems prostrate.....2. Parishella.
Anthers united and forming a tube; flowers larger.
  Corolla-tube cleft to the base on one side.....3. Lobelia.
  Corolla-tube not cleft at all.
    Filaments distinct below; corolla-tube several times longer than the limb.....
    4. Palmerella.

Filaments united.
Tube of corolla equaling or nearly as long as the limb; ovary thick (oblong or obconical) ..... 5. LAURENTIA.
Tube of corolla very short, shorter than the ample limb; ovary long and slender (stalk-like).
Corolla conspicuously 2-lipped ..... 6. DOWNINGIA.
Corolla-segments only slightly unequal ..... 7. HOWELLIA.

1. **NEMÀCLADUS** Nutt.

Low and diffusely branched annuals with very small basal leaves and minute cauline ones. Flowers minute, borne on long capillary pedicels, racemosely arranged on the very slender zig-zag branches. Corolla 2-lipped, the lower lip 3-parted, the upper 2-parted, or the segments almost distinct. Filaments united above the base; anthers distinct. Style incurved at tip; stigma capitate, 2-lobed. Capsule 2-celled, 2 or 4-valved from the tip, few to many-seeded. (Greek nemos, thread, and clados, branch, referring to its capillary habit.)

Tube of corolla elongated (1 to 1½ times as long as lobes); calyx free from ovary; filaments very deeply divided, without appendages ..... 1. *N. longiflorus.*
Tube of corolla very short (⅛ to ¼ as long as the lobes); calyx-tube more or less adnate to the ovary, the lobes about as long as the tube.
Filaments without appendages ..... 2. *N. glanduliferus.*
Anterior pair of filaments with appendages or rod-like structures.
Rods borne on an extended process of the filament.
Corolla-lobes not ciliate; stamens about as long as corolla; pedicels usually ascending; vars. of ..... 3. *N. rigidus.*
Upper corolla-lobes generally ciliate; stamens well exserted ... 4. *N. rubescens.*
Rods borne on a knob-like swelling or sessile dilation, the whole somewhat palmate ..... 5. *N. ramosissimus.*

1. **N. longiflòrus** Gray. Stems 1 to several from the base, branching, 3 to 6 in. high; calyx free from the ovary, its lobes equal, linear-oblong, acute, nearly distinct; corolla-tube elongated (2 to 2½ lines long), its lobes subequal, much shorter than the tube, the palate short-hairy; capsule long and narrow, 2-valved from top to bottom.—Mostly cismontane S. Cal., 1000 to 5500 ft., from Ventura Co. to San Diego Co.; s. to L. Cal. May.

2. **N. glandulíferus** Jepson n. sp. Plants compact, 3 to 4 in. high, the stems several from the base and very zig-zag; leaves oblong-obovate, entire; calyx-tube partly adnate to the ovary, its lobes lanceolate, acute; corolla white, its lobes ovate-lanceolate, acute; filaments without appendages; ovary surrounded by 5 glands (3 large and 2 small), forming a sort of disk, the stamen filaments arising between the glands.—W. Colorado Desert (Wagon Wash, near Sentenac Cañon, Jepson 8766, type).

3. **N. rígidus** Curran var. **montànus** Munz. Stem diffusely branched, zig-zag, 4 to 8 in. high; herbage glabrous or minutely puberulent; basal leaves oblanceolate, dentate; pedicels ascending; corolla white, 1½ lines long, strongly 2-lipped, its lobes almost twice as long as the sepals; capsule about equaling calyx; seeds with broad flat ridges, each with about 30 cells.—Montane: Butte Co.; Lake Co. to Napa Co. (N. montanus Greene.) Var. INTERIÓR Munz. Similar to var. montanus; seeds smaller, $\frac{3}{10}$ line long, its low narrow ridges with 10 long regular cells in rows between.—W. slope Sierra Nevada, 2000 to 6000 ft., from Sierra Co. to Tulare Co. Var. CAPILLÀRIS Munz. Stem not zig-zag usually; corolla 1 line long; calyx-tube long-turbinate; capsule swollen above, exceeding the calyx; seeds few (5 to 12).—Napa Co. to Humboldt Co.; Shasta Co. to Tulare Co.; Mohave Desert. (N. capillaris Greene.)

4. **N. rubéscens** Greene. Plants 3 to 4 in. high, the stems very slender; calyx-lobes linear, acute, the tube adnate to the ovary; corolla white, the upper lobes lanceolate, with brownish-purple tips or a brownish-purple spot near the tips; lower corolla-lobes oblong, acute, the upper portion red-brown and ciliate-fringed; anterior pair of filaments each with a process near the base; process thread-like, bearing 3 usually divergent slender translucent rods nearly as long; seeds with 8 or 9 longitudinal sinuous striae.—Central Mohave Desert to the western Colorado Desert. (N. adenophorus Parish.)

5. **N. ramosíssimus** Nutt. Stems many from the base, several times forked and ending in racemose flexuous flowering branches with long spreading pedicels; leaves linear, sessile, entire or slightly toothed; calyx-tube adnate to ovary; upper corolla-lobes oblong-ovate, pinkish white; lobes of lower lip narrow-ovate, whitish or pink-tinged with red-brown markings; two anterior filaments bearing a bundle of 6 (or 5) cylindric rods arising from a swollen or knob-like base; ovary bearing laterally 2 large rounded or wart-like protuberances, one on each side, which are visible between the upper and lower sets of filaments; ovary 1-celled, ovules 8; style barely cleft; stigmas 2, roundish.—Coastal mts., 1000 to 5000 ft., Monterey Co. to San Diego Co.; s. to L. Cal. (N. montanus Greene.) Var. PINNATÍFIDUS Gray. Stems slightly zig-zag; basal leaves pinnatifid; corolla very slightly exceeding sepals; capsule acutish; seeds longer than broad.—Cismontane S. Cal.; s. to L. Cal. Var. GRÁCILIS Munz. Similar to var. pinnatifidus; stems zigzag; basal leaves dentate to entire; capsule obtuse.—Monterey Co. to San Diego Co. and e. through the Mohave Desert to Inyo Co.; Nev. to Ariz. (N. gracilis Eastw.)

2. **PARISHÉLLA** Gray

Small annual. Flowers pediceled or subsessile, borne in capitate clusters, 2 or 3 heads successively proliferous from the central sessile head. Calyx-tube campanulate, its lobes spatulate, twice as long. Corolla rotate, shorter than the foliaceous calyx-lobes, almost equally 5-parted. Stamens free from the corolla; filaments united into a slender tube (except at base), strongly incurved at apex. Stigma 2-lobed. Ovary inferior except at apex. Capsule turbinate, its low-conic apex circumscissile just above the calyx-lobes. (S. B. and W. F. Parish, pioneer botanical collectors in Southern California.)

1. **P. califórnica** Gray. Stems ½ to 1½ in. long; leaves spatulate-obovate, 2 to 3 lines long; corolla white, 1½ to 2 lines long, its lobes ovate-lanceolate, acute.—Mohave Desert to w. Nev.

3. **LOBÈLIA** L.

Perennial herbs (ours) with the flowers in terminal racemes. Calyx-tube short, its limb 5-cleft. Corolla strongly 2-lipped, the tube split to the base on the upper side, the lobe on each side the cleft smaller, erect or recurved, the 3 others pendulous. Stamens 5. Anthers and upper portion of the filaments united around the style. Capsule loculicidally 2-valved. (Mathias de L'Obel, 1538-1616, a botanist of Flanders.)

1. **L. spléndens** Willd. Stem simple, erect, 1½ to 2¼ ft. high; leaves linear-lanceolate to oblanceolate, narrowed below to a petiole or the upper sessile, 3½ to 5½ in. long; raceme ¼ to 1 ft. long; calyx-tube hemispherical, its lobes slenderly linear-subulate; corolla intense red, 1¼ in. long; 2 of the anthers strongly bearded at tip; capsule subglobose, 3 lines long.—Montane slopes, 1000 to 5500 ft.: s. slopes of the San Gabriel and San Bernardino mountains to San Diego Co.; e. to Tex., s. to Mex. Aug.-Sept.

4. **PALMERÉLLA** Gray

Perennial herbs with the flowers in a terminal raceme. Calyx-tube turbinate, its lobes slender-lanceolate. Corolla with a long straight tube, its limb abruptly spreading; upper lip deeply cleft into 2 lanceolate lobes; lower lip parted into 3 obovatish lobes. Lower ⅔ of filaments adnate to the corolla-tube, the upper ⅓ free and monadelphous. Two of the anthers tipped with a close tuft of short but unequal bristles. (Dr. Edward Palmer, early botanical collector in Mexico and the Southwest.)

1. **P. débilis** Gray var. **serràta** Gray. Stems simple or branching, 1 to 2 ft. high; herbage glabrous or the inflorescence puberulent; leaves diverse in shape, varying from obovate to oblong and lanceolate or linear, 1½ to 2½ in. long, the broader ones serrate, the narrower ones disposed to be entire; calyx-lobes over half the length of the corolla-tube; corolla ½ to ¾ in. long, limb blue, its tube whitish, pubescent within.—Along streams in the hills, 500 to 3000 ft.: Monterey Co. to San Diego Co.

5. **LAURÉNTIA** Mich.

Small annuals resembling Downingia in habit and in the flower. Corolla blue, its tube as long as the limb. Ovary thick, oblong or obconical. Stamens completely united. Capsule 2-valved at apex. (M. A. Laurenti, University of Bologna.)

1. **L. carnòsula** (H. & A.) Gray. Somewhat succulent, glabrous, diffusely branching, 2 to 5 in. high; leaves sessile, lanceolate, about 3 lines long; peduncles filiform; calyx-lobes linear; upper corolla lip erect, with 2 lanceolate diverging lobes; lower lip deeply 3-cleft into roundish-obovate lobes; border bright blue with white or yellow center which is folded at throat, forming 2 prominent ridges; stamen-tube somewhat extruded from corolla-tube and bristle-tipped.—Montane, 5000 to 6000 ft.: Sierra Nevada from Nevada Co. to Lassen Co.; nw. to Wyo. and Mont. (Porterella carnosula Torr.)

909. Downingia pulchella Torr.; *a*, fl. x 2; *b*, face view of fl. x 2; *c*, anther-column x 6.

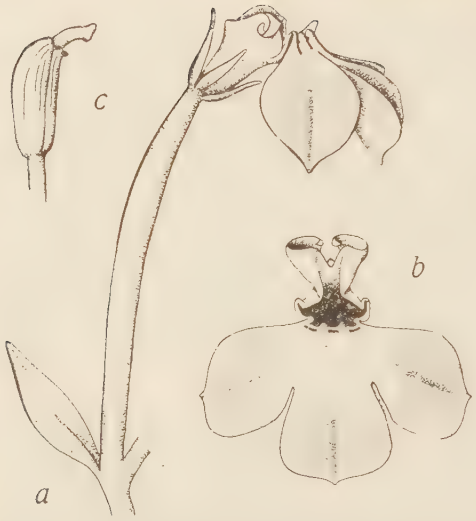
6. **DOWNÍNGIA** Torr.

Dwarf annuals. Corolla with a short tube and commonly ample 2-lipped limb; lips spreading, the larger 3-lobed, the smaller 2-cleft with narrow divisions. Ovary very long and stalk-like, 2-celled, becoming a 1-celled capsule with 2 parietal filiform placentae. Capsule long and linear, crowned with the persistent calyx-lobes, dehiscent below the apex by 1 to 3 long fissures.—These plants are found on low plains in the valleys and on flats in the mountains or sometimes in saline marshes, growing in the margins of vernal pools or in "hog wallows" or in their moist beds after the water is gone and flowering from May to July. (A. J. Downing, an American horticulturist.)

Corolla strongly 2-lipped.
- Lower lip of corolla concave, the tube campanulate; stamen-column long-exserted, the anther-tube much incurved, nearly hook-shaped ..... 1. *D. elegans.*
- Lower lip of corolla plane, forming a platform spreading at right angles to the tube which is more narrow; stamen-column little or not at all exserted, the anther-tube straight or only slightly curved.
  - Corolla-tube shorter than the calyx-lobes.
    - Sinuses of corolla not cut below platform; lobes of upper lip of corolla long, lanceolate and divergently spreading ..... 2. *D. pulchella*
    - Sinuses of corolla cut below platform.
      - Lobes of upper lip of corolla coiled into a ring; main sinuses (betweer the lips) cut straight down; lower lip with yellow spots; calyx lobes ascending ..... 3. *D. ornatissima*
      - Lobes of upper lip of corolla not coiled; main sinuses (between the lips) cut far forward so that lower lip is hinged; calyx-lobes rotate.
        - Lobes of upper lip parallel; angle of lower lip at throat with two nipples or folds; lower lip with a central quadrate maroon spot, but no yellow ..... 4. *D. concolor.*
        - Lobes of upper lip divergent, forming a V-shaped sinus; angle of lower lip at throat with 4 nipples or folds; lower lip with 2 yellow spots on a central white field... 5. *D. bicornuta.*
  - Corolla-tube longer than the calyx-lobes; no nipples or processes on angle of lower lip ..... 6. *D. cuspidata.*

Corolla obscurely 2-lipped, shorter than the calyx, its lobes subequal ..... 7. *D. humilis.*

1. **D. élegans** (Lindl.) Torr. Four to 7 (or 12) in. high; leaves oblong to oblong-lanceolate, 6 to 9 lines long; corolla light blue, veiny, the concave palate of lower lip with 2 greenish-yellow spots on a field of white; corolla-tube very short-campanulate; upper lip cut ⅔ of the way down, the segments ascending and somewhat divergent; lower lip 3-lobed at apex, the lobes parallel; side of throat next to lower lip frequently with purple spots and yellow lines; stamen-column long-exserted, about equaling the upper segments, the anther-column down-curved and bearing 2 recurved bristles on



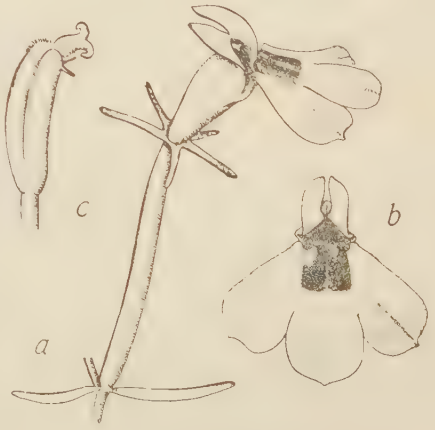
910. Downingia ornatissima Greene; *a*, fl. x 3; *b*, face view of fl. x 3; *c*, anther-column x 9.

the lower side.—San Joaquin and Sacramento valleys; Mendocino Co. to Shasta Co.; Sierra Co. to Modoc Co.; n. to Wash.

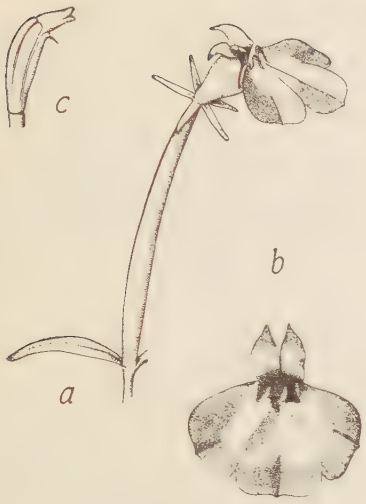
2. **D. pulchélla** Torr. Fig. 909. Erect or ascending, 2 to 10 in. high; leaves oblong-ovate or narrower, ½ in. long; calyx-lobes rotate; corolla a deep bright blue; center of lower lip white with two obovate yellow spots, contracting into narrow folds at the throat, either side of and in interval between the folds 3 dark violet spots; upper lip deeply 2-cleft, the long oblanceolate lobes very divergent and spreading; corolla-tube 1 line long, lower lip ample (6 lines broad), plane and at right angles to the tube, its lobes quadratish, divergent or trefoil-shaped; stamen-column nearly or quite equaling the upper lip; anther-tube with 2 short bristles at apex.—South Coast Ranges; Sacramento Valley; Sierra Co.; n. to southern Ore. Var. ARCÀNA Jepson. Like the species but the lobes of upper lip spreading backward; anther-tube not exserted.—W. San Diego Co.; w. Riverside Co.

3. **D. ornatíssima** Greene. Fig. 910. Erect, slender, 2 to 6 in. high, simple or branched from the base; leaves linear or subfiliform; calyx-lobes ascending; corolla very light or pale blue; lower lip with squarish white center bearing 2 yellow spots which contract into crests or folds at angle of the throat; lobes of the upper lip coiled backward into a ring, the cleft between them projected backward so as to appear like a short horn; somewhat similar horn-like folds or undulations occur laterally at base of sinuses between upper and lower lips; stamen-column exserted a little from corolla-tube, anthers standing between the coils of the upper lip.—Low spots on the plains of the Sacramento Valley and lower San Joaquin Valley.

4. **D. cóncolor** Greene. Fig. 911. Branched from the base and somewhat tufted or nearly simple, 1 to 2 (or 4) in. high, minutely puberulent; calyx-lobes rotate; flower 4 to 4½ lines broad; corolla blue, the lower lip with a velvety purple quadrate spot on the white central field (or the white mostly absent), its lobes apiculate; nipples 2, arising on the angle of the lower lip from the purple spot and guarding the entrance to the throat; lobes of upper lip lanceolate, parallel, more or less ciliate, curving horizontally backwards; no processes at lateral sinuses; stamen-column included; anther-tube with 2 short bristles at apex.—Abundant locally in low spots,



911. Downingia concolor Greene; *a*, fl. x 3; *b*, face view of fl. x 3; *c*, anther-column x 9



912. Downingia bicornuta Gray; *a*, fl. x 2; *b*, face view of fl. x 2; *c*, anther-column x 6.

Santa Clara Valley to Lake Co. and the plains of the Sacramento Valley.

5. **D. bicornùta** Gray. Fig. 912. Erect, 2 to 3 in. high; calyx-lobes rotate; corolla blue, 5 lines broad, the lower lip with a white central field and two yellow spots; lower lip with 2 ascending horns or nipples at inner angle of the lip, the lateral margins folded back at the throat into 2 less prominent nipples, making 4 in all in a transverse line; lobes of upper lip deep violet purple, very short and broad, acute and curving backwards; sinuses between corolla-lips running far forward, so that the lower lip appears hinged; stamen-column not exserted from tube, bristle at apex of anther-tube bent forward.—Low plains of the Sacramento Valley. Var. MONTÀNA Jepson. Lobes of upper lip sub-parallel, longer than in the species; sinuses not so deeply cleft.—Montane, 3000 to 5000 ft.: Sierra Nevada from Tulare Co. to Modoc Co.

6. **D. cuspidàta** Greene. Stems very slender, 6 to 7 in. high; leaves mostly 1 to 2 lines long; flowers few; corolla violet, the lower lip with a basal yellow spot bordered by white; lower lip broadly trefoil-shaped, broader than long, plane or nearly so, without protuberances or folds or nipples at the angle; lobes broadly ovate, retuse or somewhat obcordate, cuspidately pointed; lobes of the upper lip 1½ lines long, spatulate-obovate, cuspidately acute, slightly divergent; anther-tube scarcely exserted from the comparatively long (1½ lines) and narrow corolla-tube.—Valley fields, Napa and Sonoma Cos. May-June.

7. **D. hùmilis** Greene. Very dwarf, 1 to 2 in. high; calyx-segments unequal, exceeding the corolla in length; corolla minute, white, 1 line long, obscurely 2-lipped, the ovate-oblong acute segments not very unlike. — S. Sonoma Co.

7. HOWÉLLIA Gray

Annuals. Flowers more or less cleistogamous. Calyx-tube united for its whole length to the ovary, the limb with slender segments. Corolla not surpassing the calyx, its very short tube divided nearly to the base on the (apparently) upper side; lobes oblong, nearly equal, three united higher. Ovary 1-celled, the filiform parietal placentae each with 3 to 5 ovules. Capsule membranous, bursting irregularly on one side. (Thos. Howell of Portland, author of a pioneer flora of Oregon, Washington and Idaho.)

1. **H. limòsa** Greene. Weak and procumbent, the branches 1 ft. long, sometimes matted; leaves lanceolate, sessile, entire, 1 in. long; flowers cleistogamous; capsule clavate-oblong, ½ in. long, crowned by the 5 triangular calyx-teeth.—Beds of former vernal pools, Sacramento Valley.

COMPOSITAE. SUNFLOWER FAMILY

Annual or perennial herbs or shrubs with alternate or opposite leaves. Flowers perfect, unisexual or sterile, in heads, borne on the enlarged summit of the peduncle (receptacle) and surrounded by the bracts of the involucre. Receptacle with bracts subtending the flowers, or with bristles among the flowers, or without bracts or bristles (naked). Corollas tubular and 5-toothed or -lobed, or the limb strap-shaped (or ligulate) and toothed at apex, those of a head all tubular or all ligulate or of both kinds. When both kinds are present the flowers with the ligulate corollas occupy the margin of the head

and are called ray-flowers, and the ligulate corollas are called rays; the flowers with the tubular corollas occupy the center and are called disk-flowers. Ray-flowers commonly pistillate, sometimes perfect or neutral; disk-flowers commonly perfect, often staminate or pistillate. Heads with both ray- and disk-flowers are called radiate; with disk-flowers only, discoid. Calyx-tube united with the ovary, the limb when present called a pappus and greatly varied in structure, consisting of awns, hairs, bristles, scales or paleae, or in many cases appearing as a mere crown or ring or wholly obsolete. Stamens 5; filaments free; anthers united and forming a tube, or nearly or quite free in the tribe of Ambrosieae. Style divided above into 2 long branches which bear stigmatic lines on the inside. Ovary 1-celled, 1-ovuled, maturing into an achene, crowned by the pappus when that is present. Pappus commonly persistent and assisting in the dispersion of the 1-seeded fruit.

SYNOPSIS OF THE TRIBES

Heads composed wholly of perfect flowers with ligulate corollas; ligule 5-toothed at apex; herbs with milky juice; leaves alternate or basal.....1. CICHORIEAE.

Heads composed of ray- and of disk-flowers or of disk-flowers only.

A. Receptacle naked (without bristles or chaffy bracts); leaves alternate or sometimes opposite in Heleniеae.

Bracts of involucre in 1 to several series; corolla 2-lipped; anthers with long tails at base.....2. MUTISIEAE.

Bracts of the involucre equal or imbricated; flowers perfect, regular, white or whitish; rays none .....3. EUPATORIEAE.

Bracts of involucre well imbricated; disk-flowers commonly yellow, the rays of the same or different color or none; pappus of awns or bristles (or paleaceous in nos. 34 and 35, none in no. 51).....4. ASTEREAE.

Bracts of the involucre many and imbricated, often dry or scarious; pappus of capillary bristles; rays none; pistillate corollas mostly filiform; (pappus none and bracts few in no. 67); mostly white-woolly plants. 5. INULEAE.

Bracts of involucre in few series, little imbricated; pappus paleaceous, awn-like, bristly or none; flowers yellow (except no. 133); rays present, or heads discoid in a few genera.....9. HELENIEAE.

Bracts of involucre imbricated, dry and scarious; pappus none or reduced to a mere crown or ring; flowers white, yellow or greenish; rays present or absent; leaves usually much divided; herbage strong-scented.....10. ANTHEMIDEAE.

Bracts of involucre in 1 or 2 series; pappus of soft capillary bristles; both disk- and ray-flowers yellow (except no. 149).....11. SENECIONEAE.

B. Receptacle with chaffy bracts (see also nos. 27, 132, 137 and 138 and one species of nos. 111 and 120).

Rays present, conspicuous or inconspicuous (see exceptions in Heliantheae p. 984); disk-flowers perfect; bracts of the involucre foliaceous or herbaceous, not scarious; pappus of paleae or awns never capillary.

Involucre of 1 to several series of bracts, none enfolding ray-achenes; receptacle very chaffy; leaves mostly opposite or basal.....6. HELIANTHEAE.

Involucre of 1 series of equal bracts, each embracing or enfolding a ray-achene; bracts of receptacle often in a single series between ray and disk; leaves alternate or opposite; (annuals except 5 species)....7. MADIEAE.

Rays none; leaves alternate.

Heads unisexual (except no. 100), small, greenish or white; corolla of pistillate flowers none or a rudiment; anthers nearly or quite distinct; pappus none; fruit usually a bur; leaves alternate (the lower opposite in no. 102).....8. AMBROSIEAE.

Heads composed of both pistillate and staminate (or perfect) flowers; corolla of pistillate flowers filiform; bracts of the involucre few or none; leaves alternate (except no. 65); white-woolly annuals. 5. INULEAE.

C. Receptacle covered with bristles; heads large; flowers conspicuous; corollas cleft into long narrow lobes; rays none; very spiny thistles or thistle-like plants; leaves alternate .....12. CYNAREAE.

TRIBE 1. Cichorieae. CHICORY TRIBE

Herbs with milky juice and alternate or basal leaves. Receptacle almost always flat, naked or with chaff-like bracts or bristles. Flowers all perfect and all with ligulate or strap-shaped corollas, the ligule 5-toothed at apex. Anthers sagittate or auricled at base, commonly appendaged at summit. Style-branches stigmatic on their inner side for their whole length.

A. Achenes without pappus.

Leaves all basal, the cauline none or reduced to minute bracts; achenes terete or teretish.

Achenes clavate, straight, with 5 corky-thickened ribs; flowers white; leaves broadly obovate .....1. ATRICHOSERIS.

Achenes short-oblong, obscurely quadrangular, smooth-sided, slightly curved; flowers yellow; leaves all basal, lanceolate.....2. PHALACROSERIS.
Leaves basal and cauline; achenes somewhat flattened, 20 to 30-ribbed; flowers white....
3. LAPSANA.

B. Achenes with pappus.

1. PAPPUS PALEACEOUS.

Heads sessile or subsessile; paleae awnless.
Flowers blue; receptacle naked; leaves and involucral bracts not spinose.....
4. CICHORIUM.
Flowers yellow; receptacle chaffy; leaves and involucral bracts spinose..5. SCOLYMUS.
Heads pedunculate; some or all of the paleae awned; flowers yellow; receptacle naked.
Bracts of involucre in 1 series, enfolding the outer achenes; only the inner paleae of the inner achenes awned.....6. RHAGADIOLUS.
Bracts of involucre in more than 1 series, not enfolding the outer achenes; all the paleae awned.
Annuals; ligules short, the heads in anthesis small; inner bracts of involucre equal, the outer short; pappus-paleae usually 5.
Heads nodding in bud; pappus-paleae not cleft at tip, abruptly or gradually passing into the awn.....7. MICROSERIS.
Heads erect; pappus-paleae cleft at tip, with a short bristle or awn in the cleft .....8. UROPAPPUS.
Perennials; ligules long, the heads in anthesis showy; bracts of involucre imbricated in several series; pappus-paleae usually 10.....9. SCORZONELLA.

2. PAPPUS CONSISTING OF BRISTLES, THESE RARELY SLIGHTLY PALEACEOUS AT BASE.

a. Bristles of pappus (or some of them) plumose.

Achenes (at least the inner) beaked.
Receptacle naked; stems somewhat leafy.
Flowers yellow; herbage stiff and prickly.....10. PICRIS.
Flowers not yellow; herbage not stiff nor prickly.
Perennial or biennial with grass-like leaves; flowers purple; involucral bracts in 1 series.....11. TRAGOPOGON.
Annual with leaves toothed or pinnatifid; flowers white; involucral bracts in more than 1 series.....12. RAFINESQUIA.
Receptacle with chaff-like bracts; leaves basal.....13. HYPOCHOERIS.
Achenes beakless.
Receptacle naked; stems branched, more or less leafy; heads sessile or on stout peduncles; flowers pink.....14. STEPHANOMERIA.
Receptacle with scarious linear bracts; leaves all basal; heads borne on scapes; flowers yellow.....15. ANISOCOMA.

b. Bristles of pappus smooth, scabrous or barbellulate, but never plumose; receptacle naked, except no. 23 and sometimes in no. 18.

Achenes flattened; stems leafy.
Heads panicled; achenes beaked.....16. LACTUCA.
Heads corymbed or umbellate; achenes not beaked.....17. SONCHUS.
Achenes not flattened.
Heads commonly nodding in the bud; achenes beakless.
Pappus promptly deciduous, or with 1 to 4 bristles persistent; stems leafy, or scapose with the leaves all basal.....18. MALACOTHRIX.
Pappus persistent or subpersistent, the bristles about 30 to 45; stems scapose, the leaves all basal.....19. APARGIDIUM.
Heads erect in bud.
Stems scapose, the leaves all basal; achenes beaked (in Agoseris alpestris merely constricted at apex).
Achenes spinulose-toothed above.....20. TARAXACUM.
Achenes not spinulose-toothed above.....21. AGOSERIS.
Stems not scapose, more or less leafy.
Achenes beaked; desert annuals.
Plants tufted, without tack-shaped glands; receptacle naked; achenes 5-angled, with a row of pits in the intervals; apex of the achene truncately constricted, bearing a short stout beak....
22. GLYPTOPLEURA.
Plants not tufted, commonly dotted above with tack-shaped glands; receptacle bearing capillary bristles; achene 5-ribbed, narrowed above into a short beak capped by a shallow cup.....
23. CALYCOSERIS.
Achenes beakless (except in 2 species of Crepis).
Flowers yellow (or white); heads mostly in paniculate or corymbose cymes, sometimes solitary.
Pappus dull white, reddish-brown or tawny, somewhat rigid; herbage often rough-hairy; bracts not thickened in fruit.....
24. HIERACIUM.
Pappus white, soft; herbage tomentulose, hairy or glabrous; bracts in fruit often thickened at base or along midrib.....
25. CREPIS.
Flowers pink or rose-color; pappus persistent; stems often rush-like...
26. LYGODESMIA.

Tribe 2. **Mutisieae.** Mutisia Tribe

Herbs or shrubs. Leaves alternate. Heads with the flowers all alike. Corolla in ours 2-lipped with 2 lobes in upper lip and 3 in lower, the lower lip in marginal flowers often elongated. Anthers with long tails at base. Style-branches of perfect flowers not appendaged, in ours comparatively long.

Flowers yellow; bracts of the involucre in a single rank or with supplementary foliaceous bracts at base; inflorescence very leafy; receptacle densely villous...27. Trixis.
Flowers purple to white; bracts of the involucre imbricated in several ranks; inflorescence not leafy; receptacle naked.....28. Perezia.

Tribe 3. **Eupatorieae.** Eupatory Tribe

Ours herbs or suffrutescent plants with white or flesh-colored perfect disk-flowers and no rays. Receptacle naked. Anthers not caudate at base. Style-branches stigmatic only below the middle.

Annuals; leaves sessile; pappus consisting of paleae alternating with awns or bristles.
Leaves opposite; receptacle convex; involucral bracts equal, nerveless.....
29. Trichocoronis.
Leaves alternate; receptacle flat; involucral bracts unequal, nerved...30. Malperia.
Perennials; leaves petioled; pappus consisting of bristles (in Hofmeisteria some of these paleaceous at base).
Involucral bracts imbricated, striately nerved; stems usually much-branched.
Achenes with 10 nerves or ribs; leaves alternate.....31. Brickellia.
Achenes 5-angled by the strong nerves; lower leaves opposite..32. Hofmeisteria.
Involucral bracts in 2 series, nearly equal, nearly nerveless; stems simple or with a few branches.....33. Eupatorium.

Tribe 4. **Astereae.** Aster Tribe

Annual or perennial herbs or shrubs with bland watery juice. Herbage scentless, the foliage sometimes gummy or resinous. Leaves alternate. Receptacle naked. Bracts of the involucre commonly well imbricated. Disk-flowers yellow (except in some Lessingias, Pentachaetas and Conyzas), perfect in all ours except Baccharis. Rays present or absent. Anthers not caudate at base. Pappus of awns or bristles (paleaceous in Gutierrezia and Amphiachyris and sometimes in Monoptilon, none in Bellis).

A. Flowers perfect or unisexual, not dioecious.

1. Rays yellow or none (see also nos. 60 and 52; sometimes white or pink in no. 50).

a. Pappus paleaceous or of bristles united into scales in the ray-flowers; heads small; perennial herbs or bushes.

Leaves narrowly linear; disk-flowers usually fertile.....34. Gutierrezia.
Leaves obovate or elliptic; disk-flowers sterile.....35. Amphiachyris.

b. Pappus of bristles or awns, not paleaceous (except in 1 species of Haplopappus).

Pappus caducous; heads large, usually gummy; rays present, conspicuous; coarse perennial herbs .....36. Grindelia.
Pappus persistent (or sometimes deciduous in the ray-flowers); heads not gummy.
Involucral bracts with fimbriate margins; heads spherical; desert shrubs.....
37. Acamptopappus.
Involucral bracts not fringed.
Heads erect, or at least not nodding in the bud.
Achenes commonly not flattened.
Pappus bristles equal or unequal.
Leaves glandular-punctate, entire; shrubs.
Heads large, solitary; involucral bracts in about 2 series; rays many .....38. Stenotopsis.
Heads small, paniculate or corymbose; bracts well imbricated in several series; rays few or none.39. Ericameria.
Leaves commonly not glandular-punctate.
Involucral bracts not in definite vertical ranks.
Involucre destitute of foliaceous outer bracts.
Rays present; herbs, the stems from woody root-crowns.
Leaves mostly toothed or pinnately lobed, not evergreen; heads in a panicle or spike, or solitary.....40. Haplopappus.
Leaves narrow, entire, more or less evergreen; heads solitary; plants low, caespitose.
41. Stenotus.

Rays none (sometimes present in no. 43).
Flowers permanently yellow; heads in terminal cymes; woody-based plants..... 42. Isocoma.
Flowers yellow, changing to brown; heads paniculate or racemose; shrubs or perennial herbs .....43. Hazardia.
Involucre with foliaceous outer bracts passing into leaves; rays few or none; stems sometimes densely white-tomentose, the leaves green; montane undershrubs .....44. Macronema.
Involucral bracts in definite vertical ranks; involucres narrow or turbinate, the bracts rather few, becoming loose in age; heads mostly in panicles or racemes; rays none except 1 species; mostly desert shrubs..... 45. Chrysothamnus.
Pappus bristles equal; heads radiate, small, very numerous, in dense clusters; bracts unequal, well imbricated; perennial herbs.... 46. Solidago.
Achenes, at least those of the disk, flattened.
Corolla of the disk-flowers about as long as the style; pappus commonly double, the outer of short bristles or little scales.
Achenes of disk and ray with pappus or ray-flowers none; pappus bristles copious, brownish or rusty; perennial herbs, sometimes woody at base.....47. Chrysopsis.
Ray-achenes without pappus, or the pappus reduced to a deciduous crown; pappus of disk-achenes brick-red in age; tall hirsute herbs with broad serrate leaves..... 48. Heterotheca.
Corolla of outer flowers only ½ as long as the style; rays none; flowers white or yellowish; herbs.....49. Conyza.
Heads nodding in the bud; pappus of 1 to 12 bristles; leaves narrow; annuals with slender or filiform stems.....50. Pentachaeta.

2. Rays present, pink, white, blue or purple (sometimes none in Erigeron, sometimes yellow in Lessingia, sometimes very inconspicuous); herbs (except 4 shrubs or shrubby species in Aster).

Pappus wanting; rays white; disk yellow; leaves all basal; heads on scape-like peduncles... 51. Bellis.
Pappus present.
Heads with the marginal corollas commonly enlarged and more deeply cleft on the inside, thus a little palmate; annuals.....52. Lessingia.
Heads with rays.
Style-branches of disk-flowers usually more or less comose; pappus bristles reddish or rusty brown.....53. Coreth rogyne.
Style-branches of disk-flowers not comose; pappus bristles whitish.
Pappus in ray-flowers absent or squamellate; rays lavender, disk yellow; leaves sharply toothed or pinnatifid; erect or ascending annuals... 54. Psilactis.
Pappus in both ray- and disk-flowers of awns or bristles (rarely paleae).
Pappus scanty (1 to 12 awns); heads leafy-bracteate; rays commonly white, disk yellow; low or prostrate annuals.55. Monoptilon.
Pappus copious.
Disk-flowers white or whitish; rays 5, white; receptacle foveolate; bracts green-tipped .....56. Sericocarpus.
Disk-flowers yellow; rays blue, purple or sometimes white.
Pappus conspicuously barbellate, almost short-plumose; achenes flattened, with thick callous margins; tufted montane herb .....57. Townsendia.
Pappus not plumose, at most scabrous.
Involucral bracts imbricated in 2 or more series.
Style-tips lanceolate to subulate, acute; mostly tall plants with leaves 1 to 10 in. long; rays commonly blue or purple.....58. Aster.
Style-tips ovate or oblong, obtuse; low tufted desert perennial with leaves less than 5 lines long; rays commonly white..... 59. Leucelene.
Involucral bracts in 1 or 2 series, mostly equal; style-tips triangular or oblong, obtuse..... 60. Erigeron.

B. Flowers dioecious, whitish or yellowish; heads discoid; shrubs or perennial herbs .....61. Baccharis.

Tribe 5. **Inûleae.** Everlasting Tribe

Annual or perennial herbs. Herbage mostly white-woolly (except Pluchea). Leaves alternate (opposite in Psilocarphus), entire, or more or less dentate

in Pluchea and Adenocaulon. Heads small; rays none. Bracts of the involucre frequently white or scarious. Pistillate flowers mostly with filiform corollas. Sterile flowers either perfect or staminate. Anthers caudate at base. Style-branches stigmatic to the unappendaged summit. Pappus capillary or none. (One species of Pluchea is a shrub.)

A. Bracts of the involucre sac-like (open in no. 66), bearing pistillate (fertile) flowers; central cluster of flowers sterile, surrounded by chaffy bracts of the receptacle (or the receptacular bracts none in no. 65); annuals.

Fruit-bearing bracts conduplicate or sac-like, completely enclosing the pistillate flower, falling away with the achene.
Involucre below the sac-like bracts consisting of about 5 scarious plane scales; achenes gibbous, the corolla and style borne laterally; receptacle convex; pappus none; leaves alternate....62. MICROPUS.
Involucre below the sac-like bracts none; achenes straight, the corolla and style borne at the apex.
Leaves alternate.
Receptacle convex; pappus present....63. FILAGO.
Receptacle slender or columnar; pappus none or commonly none....64. STYLOCLINE.
Leaves opposite; receptacle globose; pappus none....65. PSILOCARPHUS.
Fruit-bearing bracts open, merely subtending the pistillate flowers, persistent; pappus none. 66. EVAX.

B. Bracts of the involucre numerous (5 in no. 67), not sac-like; bracts of the receptacle none; perennials or annuals.

Achenes bearing stipitate glands; pappus none; leaves broad, woolly beneath....67. ADENOCAULON.
Achenes without glands; pappus present.
Bracts of the involucre scarious; herbage woolly.
Flowers all fertile, perfect and pistillate in the same head....68. GNAPHALIUM.
Flowers dioecious.
Central flowers of pistillate heads sterile; robust herb....69. ANAPHALIS.
Central flowers of pistillate heads fertile; low herbs....70. ANTENNARIA.
Bracts of the involucre dry but not scarious; herbage not woolly....71. PLUCHEA.

TRIBE 6. **Heliántheae.** SUNFLOWER TRIBE

Herbs (or shrubs) with mostly opposite or basal leaves and with balsamic-resinous juice. Rays commonly present, almost always showy. Bracts of the involucre herbaceous or foliaceous, or at least not scarious. Receptacle with chaff-like bracts, each subtending a flower. Anthers not caudate. Pappus paleaceous, of rigid awns, or cup-like, never of capillary bristles. Achenes thick or flattened contrary to the subtending chaffy bract, rarely parallel with it.—Rays none in no. 75 and 1 species of nos. 76, 79, 83, 84 and 87.

Inner bracts of the involucre completely enclosing the ray-achenes, i. e. sac-like; herb....72. MELAMPODIUM.
Inner bracts of the involucre plane or nearly so.
Rays white, short; herbs.
Bracts of the receptacle nearly bristle-like; disk-corollas 4-toothed...73. ECLIPTA.
Bracts of the receptacle broad, chaffy; disk-corollas 5-toothed....74. GALINSOGA.
Rays yellow or none.
Pappus plumose; heads discoid; nearly leafless shrub....75. BEBBIA.
Pappus present or none, never plumose.
Involucre of 2 or more series of similar bracts.
Disk-achenes thickened, angled, not at all compressed or only slightly compressed.
Rays sterile.
Pappus persistent or none.
Pappus a toothed crown or none; receptacle high conic or columnar; leaves basal or alternate; perennial herbs....76. RUDBECKIA.
Pappus of 2 awns and several short intervening scales, or pappus none; receptacle flat or conic; leaves cauline, alternate or opposite; shrubs or herbs. 77. VIGUIERA.
Pappus present, caducous; receptacle flat to low conic....78. HELIANTHUS.
Rays fertile; receptacle flat or convex; low herbs, the leaves mostly basal except in 2 or 3 species.
Pappus none; leaves entire to pinnatifid..79. BALSAMORHIZA.
Pappus present; leaves mostly entire....80. WYETHIA.
Disk-achenes strongly flattened.
Achenes not winged; rays sterile.
Achenes not ciliate (except 1 species of no. 81), with a pappus crown of minute scales (distinct or united) between the awns; heads solitary; herbs.

Herbage green, stems leafy; ours cismontane.....
81. Helianthella.
Herbage with silvery felt; stems scapose; deserts.....
82. Enceliopsis.
Achenes ciliate; heads in panicles or cymes or solitary.
Shrubs; achenes without pappus-crown, usually without awns .....83. Encelia.
Herbs; achenes with crown and awns.....84. Geraea.
Achenes winged on each edge; pappus-awns 2; herbs.....
85. Verbesina.
Involucre of 2 very unlike series of bracts; herbs or shrubs.
Pappus various or none, never barbed.....86. Coreopsis.
Pappus of 2 to 4 barbed awns.....87. Bidens.

Tribe 7. **Madieae.** Tarweed Tribe

Ours annuals (except one species of no. 98 and 2 species of nos. 91 and 94). Herbage glandular, viscid or heavy-scented (except nos. 97, 98 and 99). Leaves alternate or opposite. Bracts of the involucre in a single series, each partly or completely enclosing an achene. Bracts of the receptacle commonly in a single series between disk- and ray-flowers and often united into a cup, or sometimes scattered among the disk-flowers. Rays always present, showy or inconspicuous. Anthers not caudate. Ray-achenes always fertile, without pappus (except nos. 88, 93 and 98, and one species in no. 94); disk-achenes fertile or sterile, their pappus paleaceous, awn-like or none.

Bracts of the involucre plane, merely subtending the ray-achenes; pappus-paleae many, fimbriate, present in both disk and ray flowers.....88. Blepharipappus.
Bracts of the involucre not plane.
Ray-achenes half enclosed by the involucral bracts which are rounded on the back; achenes often obcompressed.
Achenes of ray without pappus; pappus of disk-achenes often hirsute, not plumose.
Receptacle conical or convex; bracts of involucre and receptacle persistent.
Leaves (at least the upper) spinose and rigid, little viscid or glandular; rays 25 to 40, 2-lobed; bracts of involucre and receptacle without processes .....89. Centromadia.
Leaves not spinose; rays about 15, 3-lobed; outer bracts of involucre beset with clavate processes.....90. Holocarpha.
Receptacle flat; bracts of involucre and receptacle at length deciduous.
Rays 5 to many, 3-lobed or -toothed; pappus present or none; areola of the ray-achenes intra-apical, most commonly raised on a distinct beak; lower leaves usually toothed to pinnatifid.....
91. Hemizonia.
Rays 1 to 5 (or 8), broader than long, palmately 3-lobed; achenes with paleaceous pappus; areola of the ray-achenes terminal and central or nearly so; leaves all narrowly linear and entire.....
92. Calycadenia.
Achenes of ray with pappus; disk-achenes with plumose pappus.....
93. Blepharizonia.
Ray-achenes completely enfolded by the involucral bracts which are usually either flattened or strongly carinate on the back.
Achenes of ray laterally compressed; involucral bracts strongly carinate on the back; ray-flowers without pappus, disk-flowers without or with pappus..
94. Madia.
Achenes of ray not laterally compressed, often obcompressed; involucral bracts with flattish or sometimes rounded backs.
Achenes in fruit not expanding; pappus present or none.
Vernal annuals; rays 8 to 20, commonly showy, yellow, white, or yellow tipped with white; ray-pappus none; disk-pappus commonly present .....95. Layia.
Summer plants; rays 5, comparatively inconspicuous.
Annuals; heads clustered; rays yellow; pappus in disk and ray none.
Bracts of the receptacle united.....96. Hemizonella.
Bracts of the receptacle distinct.....97. Lagophylla.
Perennial; heads solitary; bracts of receptacle connate; rays white or rose-tinged; pappus of disk and ray present.....
98. Holozonia.
Achenes in fruit expanding into an open globose head; pappus silvery-scarious, the longer set of paleae longer than the achenes.....
99. Achyrachaena.

Tribe 8. **Ambrosieae.** Ragweed Tribe

Coarse homely weeds or shrubs with small greenish or white heads. Leaves alternate or the lowest opposite in no. 102. Flowers unisexual, the staminate and the pistillate in separate heads (the staminate heads in a raceme or

spike above the pistillate heads, which are few and axillary) or in the same head (heads solitary in the axils). Receptacle of the staminate or of the perfect heads with chaff-like bracts. Rays none. Corolla of pistillate flowers none or a mere rudiment. Anthers distinct or scarcely coherent, not caudate. Pappus none. Fruit commonly a bur.

Heads (or at least some of them) containing both staminate and pistillate flowers, the latter at the margin; involucre of 4 or 5 bracts.
Achenes not flattened, more or less turgid; heads containing both staminate and pistillate flowers (androgynous).
Heads nodding; achenes glabrous or puberulent; leaves entire.....100. Iva.
Heads erect; achenes long-villous; leaf-divisions filiform.....101. Oxytenia.
Achenes strongly flattened, broadly pectinate-winged and subtended by broad scarious bracts; heads androgynous and staminate.....102. Dicoria.
Heads unisexual, both pistillate and staminate on the same plant; involucre of pistillate heads closed and bur-like, only the style-branches exserted; staminate heads in a raceme or spike, their involucres open.
Involucral bracts of staminate heads united.
Fruiting involucres bur-like, armed with spines; leaves variously toothed or pinnatifid.
Bur with a single beak at apex and armed near the beak with a single row of short spines.....103. Ambrosia.
Bur with 1 to 4 beaks, armed with several rows of short spines.....104. Franseria.
Fruiting involucres winged with broad silvery-scarious wings or scales; leaves or their divisions filiform.....105. Hymenoclea.
Involucral bracts of staminate heads distinct; involucre of pistillate heads maturing into a stout extremely spiny bur.....106. Xanthium.

Tribe 9. **Heleniеae.** Sneezeweed Tribe

Herbs or some Eriophyllums suffruticose. Leaves alternate or opposite. Flowers commonly yellow. Rays present or none in some species. Anthers not caudate. Receptacle naked (except in no. 132 and in 1 species of nos. 111 and 120). Bracts of the involucre in 1 or 2, sometimes in 3 or 4 series. Pappus of paleae, awns or bristles, or often wanting.

A. Bracts of involucre woolly, hairy or glabrous, never dotted with large oil-glands.

Rays deciduous, not papery, or rays none.

a. Involucral bracts in a single series.

Leaves opposite.
Involucral bracts united into a toothed cup; pappus paleaceous or none.
Rays none; leaves long-acuminate; perennials.....107. Pericome.
Rays present; leaves mostly linear; annuals.....108. Lasthenia.
Involucral bracts distinct; annuals (except one).....109. Baeria.
Leaves alternate, sometimes the basal or lower ones opposite.
Rays conspicuous or obvious.
Ray-corollas with a tooth or ligule at base opposite the ray; pappus none; herbage white-woolly, at least when young; annuals.....110. Monolopia.
Ray-corollas without tooth or appendage at base.
Herbage, at least when young, white-woolly; disk-flowers yellow.
Pappus paleaceous; annual or perennial herbs....111. Eriophyllum.
Pappus of numerous bristles united at base or none; annuals.....112. Syntrichopappus.
Herbage not white-woolly.
Leaves pinnately parted or divided; rays yellow; achenes not flattened, not ciliate; pappus in ours none.
Herbage puberulent; involucral bracts distinct; perennial herbs...113. Bahia.
Herbage glabrous; involucral bracts united for lower half or third; annuals.....114. Blennosperma.
Leaves palmately lobed, cordate in outline; achenes flattened, ciliate; rays white or yellow; pappus present; herbage viscid-puberulent.....115. Perityle.
Rays inconspicuous or none (see also 2 species in no. 111).
Achenes flat.
Pappus present; achenes strongly flattened, bordered with a dense or shaggy mass of long hairs, the sides black, glabrous or glabrate; heads radiate or discoid; herbage woolly; annuals.....116. Eatonella.
Pappus none; achenes moderately flattened, puberulent or slightly ciliate; heads discoid; herbage green; perennial herb.....117. Laphamia.
Achenes narrow or pyramidal, mostly terete or angled, not flattened.
Heads radiate; pappus-paleae 3 to 5, subulate, curved; annuals.....118. Rigiopappus.

Heads discoid.
Herbage gummy; flowers yellow, pappus of 8 to 12 obtuse paleae; annuals .....119. AMBLYOPAPPUS.
Herbage not gummy; corollas all alike or sometimes the marginal corollas with unequal lobes or palmately enlarged as if radiate; annuals or perennials.
Styles whitish or dull color; flowers yellow or white; leaves pinnately parted or dissected, rarely entire.....
120. CHAENACTIS.
Styles pinkish; flowers whitish; leaves linear or linear-lanceolate, entire .....121. PALAFOXIA.

b. Involucral bracts in 2 or more series; perennial herbs or some annual or biennial in nos. 124 and 125.

Heads discoid.
Involucral bracts herbaceous; pappus-paleae 5, dissected into slender tawny bristles; annuals .....122. TRICHOPTILIUM.
Involucral bracts with scarious often colored margins; pappus-paleae 10 to 12, thin, obtuse or curved; perennial herbs.....123. HYMENOPAPPUS.
Heads radiate.
Bracts of involucre erect.
Pappus paleaceous.
Bracts of involucre in 2 unlike rows, the outer united at base; leaves punctate; deserts .....124. HYMENOXYS.
Bracts of involucre distinct, all much alike; paleae hyaline; leaves not punctate; montane .....125. HULSEA.
Pappus none.
Leaves alternate .....126. VENEGASIA.
Leaves opposite; succulent perennial herb.....127. JAUMEA.
Bracts of involucre reflexed; rays short and broad, usually drooping or deflexed.....
128. HELENIUM.

2. RAYS PERSISTENT AND BECOMING PAPERY; HERBAGE MORE OR LESS WHITE-WOOLLY; FLOWERS YELLOW.

Leaves all in a basal tuft, the heads scapose; pappus paleaceous, the paleae awned.....
129. ACTINELLA.
Leaves borne along the stems.
Rays few but conspicuous, very broad; pappus paleaceous.....130. PSILOSTROPHE.
Rays several to numerous; pappus none.
Bracts of involucre numerous, in 2 or 3 series; corolla-teeth bearded; receptacle naked; leaves alternate.....131. BAILEYA.
Bracts of involucre 9 to 12, in 1 series or nearly; corolla-teeth glabrous; receptacle densely hairy; leaves opposite.....132. WHITNEYA.

B. Bracts of the involucre dotted or striped with oil-glands, equal and disposed in one series; herbage glabrous.

Leaves alternate; perennial herbs.
Achenes rusty-pubescent.
Pappus of copious capillary bristles; heads discoid; flowers dull white or purple..
133. POROPHYLLUM.
Pappus of both bristles and awned paleae; heads radiate, the rays purple or flesh-color .....134. NICOLLETIA.
Achenes glabrous; pappus-paleae each divided into slender bristles; heads radiate or rayless .....135. DYSODIA.
Leaves opposite; heads radiate; involucral bracts strongly keeled; annuals...136. PECTIS.

TRIBE 10. **Anthemídeae.** MAYWEED TRIBE

Strong-scented or aromatic plants. Leaves alternate, all or some of them finely dissected, pinnately parted or pinnatifid, or often merely toothed or entire in no. 142. Bracts of the involucre imbricated, commonly dry and scarious or with scarious margins. Receptacle naked or with chaff-like bracts. Flowers white, yellow or greenish. Rays present or none. Anthers not caudate. Pappus none or a short scarious crown.

A. Receptacle with chaff-like bracts.

Heads solitary, terminating leafy branches or peduncles; rays 14 to 20; annual.....
137. ANTHEMIS.
Heads in a terminal corymb; rays 4 or 5; perennial.....138. ACHILLEA.

B. Receptacle naked.

All the flowers with a corolla.
Rays many, conspicuous; heads solitary, terminating leafy branches or peduncles.....
139. CHRYSANTHEMUM.

Rays none.
Head solitary or corymbose.
Heads corymbose; flowers yellow; perennial herbs.....140. TANACETUM.

Heads solitary, terminating leafy branches or peduncles; flowers greenish; annual herbs .....141. MATRICARIA.
Heads in racemose panicles or somewhat spike-like; flowers yellow or purplish; shrubs or herbs .....142. ARTEMISIA.
Marginal flowers without a corolla; heads discoid.
Heads peduncled; mature achenes borne on pedicels; style deciduous...143. COTULA.
Heads sessile; achenes pointed with the spine-like persistent style.....144. SOLIVA.

TRIBE 11. **Senecióneae.** GROUNDSEL TRIBE

Herbs, or a few species shrubs or woody-based plants. Leaves alternate or basal, sometimes opposite. Bracts of the involucre little or not at all imbricated, mostly in 1 or 2 rows. Receptacle naked. Flowers of both disk and ray yellow, except Petasites. Anthers not caudate. Pappus-bristles soft, commonly copious, most often white.

Receptacle conical; rays present; annuals.....145. CROCIDIUM.
Receptacle flat.
Corolla throat elongated-cylindric, 4 to 5 times longer than the proper tube; pappus shorter than the corolla; heads discoid; annuals.....146. PSATHYROTES.
Corolla throat commonly much shorter than the tube, at least not exceeding it.
Herbs (except 2 species in no. 152).
Pappus-bristles 15 to 25, short, soft, plumose; heads solitary, discoid; leaves basal, entire .....147. RAILLARDELLA.
Pappus-bristles not truly plumose.
Leaves large, palmately cleft or parted, mostly basal; heads corymbose; perennials.
Heads few, rayless; flowers all fertile, yellow; styles united about half way .....148. CACALIOPSIS.
Heads many, radiate; flowers of 2 sorts, the perfect ones whitish and the pistillate ones pinkish; styles united nearly to the apex .....149. PETASITES.
Leaves entire to toothed, pinnatifid or pinnate.
Leaves alternate or basal.
Flowers white, whitish or pinkish; heads discoid; stems leafy.
Leaves not auricled, entire; herbage cottony-pubescent; perennials .....150. LUINA.
Leaves auriculate at base, pinnatifid or denticulate; herbage tomentulose, glabrate; annuals.....
151. ERECHTITES.
Flowers commonly yellow or yellowish; heads radiate, sometimes rayless; pappus soft; perennials, or sometimes annuals .....152. SENECIO.
Leaves all opposite or only the upper ones alternate; heads radiate or rayless; pappus-bristles denticulate, rather rigid; perennials .....153. ARNICA.
Shrubs or shrubby plants; heads discoid.
Bracts of the involucre many to numerous; herbage (at least when mature) glabrous or nearly so.
Branches very leafy, the leaves terete, resinous-dotted.....
154. PEUCEPHYLLUM.
Branches naked and rush-like, the leaves scale-like.....
155. LEPIDOSPARTUM.
Bracts of the involucre 4 to 6; heads 4 to 9-flowered; foliage leaves narrow but plane; plants canescently tomentose.....156. TETRADYMIA.

TRIBE 12. **Cynàreae.** THISTLE TRIBE

Thistles or thistle-like herbs with alternate prickly leaves. Heads large. Bracts of the involucre imbricated, usually prolonged into a spine or bristle, or provided with a membranous edge. Receptacle bristly or hairy. Flowers all perfect. Rays none. Corollas tubular, cleft into long narrow lobes. Anthers long-tailed at the base, with elongated appendages at the tip. Pappus bristly or plumose, rarely paleaceous.

Leaves with margin more or less prickly or spinose.
Achenes obliquely or somewhat laterally inserted on the receptacle; heads almost concealed by upper leaves.....157. CNICUS.
Achenes inserted on the receptacle by their very bases; heads not concealed by upper leaves.
Leaves conspicuously blotched with white along the veins; pappus of narrow barbellate paleae .....158. SILYBUM.
Leaves never blotched with white; pappus of plumose bristles united at base and deciduous in a ring.
Bristles of pappus in several series; achenes somewhat 4-angled.....
159. CYNARA.
Bristles of pappus in a single series; achenes not angled.....160. CIRSIUM.

Leaves with margin not prickly or spinose.
Involucral bracts hooked at tip; leaves very broad.....161. ARCTIUM.
Involucral bracts not hooked at tip; leaves never broad.....162. CENTAUREA.

TRIBE 1. **Cichorieae.** CHICORY TRIBE

Herbs with milky juice and alternate or basal leaves. Receptacle naked or with chaff-like bracts. Flowers all perfect and all with ligulate corollas, the ligule 5-toothed at apex. Anthers sagittate or auricled at base, commonly appendaged at summit. Style-branches stigmatic on their inner side for their whole length.

1. ATRICHÓSERIS Gray

Glabrous annual with broad basal leaves and 1 to several tall scape-like cymosely-branched stems. Involucre of 10 to 15 equal linear acute bracts and several small outer ones. Receptacle scrobiculate. Flowers white. Achenes shortly oblong-clavate, with corky-thickened ribs. Pappus none. (Greek athrix, without hair, and seris, a cichoriaceous plant.)

1. **A. platyphýlla** Gray. TOBACCO WEED. Stems 1 to several, erect or ascending, slightly glaucous, shining, 1 to 2½ ft. high, ending above in a diffuse cymose panicle; leaves broadly obovate, obtuse, sessile, spinulose-toothed or -erosulate, 1½ to 3½ in. long, the cauline ones few, much reduced and bract-like; heads 1 in. broad; involucres 2½ to 3 lines high; ligules broad, much-exserted; achenes whitish, usually with 5 much-thickened corky ribs and 5 small alternate ones, truncate with a small depressed area at summit, 1½ to 1¾ lines long.—Gravelly valleys or rocky slopes, 150 to 2500 ft.: n. side Colorado Desert; e. Mohave Desert; e. to Utah. Apr.-May.

2. PHALACRÓSERIS Gray

Glabrous perennial herbs with naked 1-headed scapes arising from a tuft of basal leaves on the root-crown. Involucre campanulate, of 12 to 16 lanceolate bracts, naked or with 1 or 2 small loose bracts at base. Flowers yellow, opening in sunshine. Receptacle naked. Achenes short-oblong, slightly incurved. Pappus none. (Greek phalakros, bald-headed, and seris, the Hellenic name of some kind of cichoriaceous plant.)

1. **P. bolánderi** Gray. Scapes 1 to several, slender, erect, ⅔ to 2 ft. high; leaves linear-lanceolate or oblong-oblanceolate, entire, slightly succulent, narrowed to a short or long petiole, the whole 3 to 13 in. long; heads ¾ to 1 in. broad; involucres 4 to 5 lines high; ligules well exserted; achenes obscurely quadrangular, truncate at both ends, 1½ to 1¾ lines long.—Wet mountain meadows, 7000 to 8000 ft., Sierra Nevada: Westfalls Mdw., above Yosemite Valley; Sage Mdw., near Shuteye Mt., Madera Co.; Grant Park. Var. CORONÀTA Hall. Achenes with a short crown.—Mariposa Co.: Cathedral Peak; Peregoy Mdws.; upper Chilnualna Creek; s. to Fresno Co.

3. LÁPSANA L.

Annual herbs. Leaves alternate. Flowers yellow, the heads on slender peduncles and disposed in a panicle. Involucre subcylindric, its bracts in one series, nearly equal, with a few minute outer ones at base. Receptacle naked. Achenes obovate-oblong, somewhat flattened, narrowed below, rounded at apex, 20 to 30-nerved. Pappus none. (Greek lampsana, the Dioscoridean name of a crucifer.)

1. **L. commùnis** L. NIPPLEWORT. Stems erect, 1 or few from the base, simple below, paniculately branched above, 2 to 2¼ ft. high; herbage hirsute- or pilose-pubescent below, glabrous above; leaves ovate, dentate, 1 to 1¾ in. long, commonly with 1 or 2 pairs of supplementary leaflets below the main blade, the petioles 3 to 12 lines long; involucres pale green, glabrous and glaucous, 2 to 2½ lines long, its bracts 7 to 9, linear-oblong; achenes 1⅓ lines long.—Nat. from Eur.: Arcata, Humboldt Co.; also in sw. Ore. (Chetco River). June.

4. CICHÒRIUM L.

Perennial herb, the leaves mostly basal, those of the stiff branching stem reduced and bract-like. Flowers blue, in sessile heads. Receptacle naked.

Bracts of the oblong involucres herbaceous, in 2 series, the outer 4 or 5, somewhat spreading, the inner about 8, erect. Achenes 5-angled, truncate, beakless. Pappus of 2 or 3 series of short blunt paleae. (Altered from the Arabic name.)

1. **C. íntybus** L. CHICORY. Stems erect from a deep taproot, 2 to 4 ft. high; herbage more or less hirsute; basal leaves spatulate to obovate or oblong, 3 to 5 (or 10) in. long; cauline leaves lanceolate, more or less auriculate-clasping at base, runcinate-pinnatifid or toothed; heads in sessile clusters along the nearly naked branches; flowers blue, rarely white.—Garden plant from Eur., naturalized in low moist valleys: Eureka; Sacramento Valley; Napa Valley; Berkeley; Santa Clara Valley; San Diego. Also called Blue-weed.

5. SCÓLYMUS L.

Erect glabrous thistle-like herb. Leaves alternate, rigid, coriaceous, sinuate-dentate or pinnatifid, decurrent, the lobes spinescent. Heads rather large, terminal and lateral, sessile. Flowers yellow. Bracts of the involucre in few rows, scarious-margined and spinescent-tipped, subtended by foliaceous bracts. Receptacle chaffy, the chaff more or less embracing the beakless achenes. Pappus a crown of scarious unequal paleae. (Old Greek name.)

1. **S. hispánicus** L. GOLDEN THISTLE. Plants 1 to $1\frac{1}{2}$ ft. high; leaves 2 to 3 in. long.—Nat. from s. Eur.: Los Gatos. July.

6. RHAGADÍOLUS Tourn.

Annual herbs with yellow flowers. Bracts of the involucre in a single series, narrow, incurved, enfolding the marginal achenes, stellately spreading in age, sparingly hispid. Receptacle naked. Achenes 5 to 10-ribbed, the ribs barbellate. Pappus of outer achenes a crown of denticulate or fimbriate paleae; pappus of inner achenes double, the inner set consisting of bristles paleaceous-dilated towards the base, the outer set consisting of short scales or none. (Etymology unknown to us.)

1. **R. hedỳpnois** All. Stem commonly branched from the base, the branches diffuse or divaricately spreading, 5 to 13 in. long; basal leaves petioled and often lobed, the cauline leaves oblanceolate to linear, $1\frac{1}{4}$ to 5 in. long, shallowly pinnatifid to serrate or entire, sessile or the lower ones drawn down to a short petiole; flowering heads 3 to 4 lines broad, borne on mostly naked elongated peduncles; involucres 4 to 5 lines high; achenes cylindric, 3 to $3\frac{1}{2}$ lines long; pappus-paleae 1 line long, the bristles $2\frac{3}{4}$ lines long.—Nat. from Asia Minor: Penn Valley, Nevada Co.; Oroville foothills; Atwater; Hornitos; Los Angeles; San Diego.

7. MICRÓSERIS Don

Low annuals with basal leaves and naked scape-like one-headed peduncles. Herbage glabrous or only slightly puberulent. Leaves pinnatifid with mostly linear and often falcate lobes, or entire. Heads in anthesis narrowly obiong to ovoid or subglobose, nodding in the bud, mostly erect in fruit. Receptacle naked. Ligules short. Achenes slender-fusiform or cylindric, ribbed, mostly truncate. Pappus-paleae 5, mostly short, abruptly or gradually passing into the scabrous awn. (Greek micros, small, and seris, lettuce.)

Achenes fusiform, attenuate above the middle, the upper part not filled by the seed, 3 to $4\frac{1}{2}$ lines long ..... 1. *M. attenuata.*
Achenes attenuate toward base or even almost turbinate, wholly filled by the seed.
  Paleae very small or almost none ..... 2. *M. aphantocarpha.*
  Paleae conspicuous.
    Awns shorter than paleae; heads at maturity turbinate.
      Paleae broadly ovate; achenes $1\frac{1}{2}$ to 2 lines long ..... 3. *M. platycarpha.*
      Paleae narrowly lanceolate; achenes $2\frac{1}{2}$ to 3 lines long .... 4. *M. acuminata.*
    Awns longer than paleae; heads at maturity hemispherical.
      Achenes contracted under the summit, 2 to 3 lines long ..... 5. *M. douglasii.*
      Achenes not contracted under the summit, $1\frac{1}{2}$ to 2 lines long. 6. *M. bigelovii.*

1. **M. attenuàta** Greene. Scapes several to many, erect or at base decumbent, 10 to 13 in. high, slightly enlarged at summit; leaves linear in outline, 3 to 7 in. long, mostly pinnately toothed or parted into remote linear segments 2 to 9 lines long, or denticulate; involucres 5 to 7 lines high; inner

bracts rather broadly linear-attenuate to lanceolate, the short outer basal ones calyculate; flowers purplish; achenes fusiform, narrowing above the middle and again enlarged at the truncate apex, 10-ribbed, dull brown, 3 to 4½ lines long, the upper half not filled by the seed; pappus yellowish white to fuscous, 4½ to 5½ lines long; paleae oblong or ovate or lanceolate, ½ to ⅓ the length of the awn, externally either lightly or conspicuously villous; awns barbellate.—Valleys and foothills, 50 to 1500 ft.: Sacramento Valley and foothills west; s. to Alameda Co.; Orange Co. Apr.-May. Var. PÁRVULA Jepson n. comb. Very small, 2 to 2½ in. high; pappus 3 lines high, the paleae soft villous-pubescent.—Contra Costa Co. (M. parvula Greene.)

2. **M. aphantocárpha** Gray. Scapes decumbent at base or wholly erect, 8 to 16 in. high; herbage glabrous or often mealy-puberulent; leaves subentire or pinnatifid, 3 to 7 in. long; expended fruiting heads 7 to 11 lines broad; involucres 3 to 5 lines high; inner bracts lanceolate to ovate, acuminate, the outer short, ovate; achenes slender, 1¾ to 2¼ lines long; pappus tawny, 1¾ to 3½ lines long, the paleae much reduced or even obsolete, the bristles slender, fragile or deciduous.—Hillslopes, 500 to 1500 ft.: South Coast Ranges; Apr.-May. Var. TENÉLLA Gray. Pappus bristles commonly but 2 or 3, with a manifestly ovate palea at base, or sometimes none.—Napa Valley; lower Sacramento Valley; San Luis Obispo Co. Var. INDIVÌSA Jepson. Scapes strictly erect, ½ to 1½ ft. high; leaves oblanceolate, entire or few-toothed or pinnatifid, 2½ to 10 in. long; outer row of achenes often silvery-silky; pappus 3 to 4 lines long, the paleae triangular.—Beds of former vernal pools, 50 to 500 ft.: Solano Co.; Contra Costa Co.; San Mateo Co. Apr.-May. (M. indivisa Greene.) Var. MARIPOSÀNA Jepson n. var. Leaves pinnatifid into slender segments, these somewhat toothed; achenes slender-obconic, a little more than 1 line long; pappus about 2 lines long, the paleae deltoid.—Mariposa Co. (Mariposa, J. W. Congdon, type). Var. ÉLEGANS Jepson n. comb. Expanded fruiting heads 5 to 8 lines broad; achenes about 1 line long; paleae ovate-deltoid, ¼ to ⅓ line long, the awn 1½ to 2 lines long, persistent.—Plains and valleys: Sierra Nevada foothills; Great Valley; South Coast Ranges; coastal S. Cal. Apr. (M. elegans Greene.)

3. **M. platycárpha** Gray. Scapes several to many, slender, erect or decumbent at base, 3 to 15 in. high; leaves oblong to oblanceolate, entire to pinnatifid, petioled, 2 to 4 in. long; heads in fruit broadly turbinate; involucres 4 to 5½ lines high; inner bracts elliptical to oblong, acute or obtusish, the outer very small; flowers purplish; achenes slenderly obconic, minutely but rather densely scabrous, 1½ to 2 lines long; pappus 2½ to 3½ lines long, somewhat pubescent, the paleae broadly ovate to oblong-ovate, pale to dark smoky, with incurved crenate margins, terminating in an awn about ⅔ as long.—Flats on the mesas or sandy fields, 20 to 500 ft.: Santa Catalina Isl.; w. San Diego Co.; s. to L. Cal. Apr. Var. PARÍSHII Hall. Achenes 1½ to 1¾ lines long; pappus pale, 3 to 4 lines long; paleae lanceolate.—San Pedro to San Diego. Very variable. (M. parishii Greene.)

4. **M. acuminàta** Greene. Scapes few, decumbent at base, 4 to 12 in. high; leaves deeply pinnatifid into

913. Microseris douglasii Gray; *a*, habit x ⅓; *b*, achene and pappus x 1½.

slender lobes, 3 to 4 in. long; heads narrowly oblong, in maturity turbinate, 10 to 11 lines high; achenes slenderly fusiform, 3 lines long, the ribs scabrous; pappus 7 to 8 lines long; shining brown paleae narrowly lanceolate, gradually attenuate into an awn which is shorter than the paleae.—Valleys in the hills, 200 to 1500 ft.: North Coast Ranges from Napa Co. to Humboldt and Tehama Cos.; Sierra Nevada foothills in Eldorado Co. Apr.-May.

5. **M. douglàsii** Gray. Fig. 913. Scapes 6 to 17 in. high; leaves oblanceolate, coarsely pinnately cleft or parted to nearly entire, 3½ to 4½ in. long; heads broadly ovoid or in age hemispherical; involucres 5 to 6 lines high, the inner bracts ovate-attenuate to lanceolate, the outer very short, ovate; flowers purplish; achenes linear-turbinate, tapering to the base, somewhat contracted just below the summit, 10-ribbed, 2 to 3 lines long, the outer ones usually white-villous; pappus yellowish to fuscous; paleae ovate to orbicular, entire or erose, commonly imbricated or convolutely overlapping, silky-villous to glabrous, 1 to 2 lines long, tapering to a bristle 2 to 3 lines long.—Valleys, 50 to 3500 ft.: Great Valley; Coast Ranges; coastal S. Cal. Apr.-May.

6. **M. bigelòvii** Gray. Scapes erect or ascending, 6 to 15 in. high; leaves entire or pinnatifid; heads broadly ovate, ½ in. high; involucre disposed to be somewhat imbricated; achenes oblong-turbinate, 1½ to 2 lines long, not contracted under the truncate summit, the outermost sometimes villous; pappus brownish or almost rusty, the paleae oblong- to ovate-lanceolate, commonly glabrous, varying in size, as long as or only ½ to ⅓ as long as the awn.—Sandy fields near the coast, 50 to 300 ft.: San Francisco and Alameda Cos. to Humboldt Co. Apr.-May.

8. **UROPÁPPUS** Nutt.

Low annuals with basal leaves and naked one-headed scapes. Leaves pinnatifid with mostly subulate or acuminate lobes or entire. Scapes enlarged at summit. Heads oblong, erect; ligules short, the heads in anthesis small. Main bracts of the involucre about equal, but with shorter ones at base, all membranous. Receptacle naked. Achenes 10 to 12-ribbed. Pappus-paleae 5, elongated, tipped with a very short awn or bristle which proceeds from the cleft summit. (Greek oura, a tail, and pappos, pappus, on account of the bristle-like appendage to the paleae.)

914. Uropappus linearifolius Gray; *a*, habit x ⅛; *b*, achene and pappus x 1.

Pappus glistening white to tawny, soft, deciduous from the dark brown to black achenes.....
1. *U. linearifolius.*

Pappus dull brown or sordid, of firm texture, persistent on the light colored or brownish achenes.....
2. *U. lindleyi.*

1. U. lineàrifòlius Nutt. Fig. 914. Scapes often several from the base, erect, 6 to 20 in. high, in robust plants thickened or fistulous under the oblong head; leaves linear (3 to 6 in. long and 1 to 2 lines wide), commonly with 2 or 3 to several pairs of more or less remote salient segments; expanded fruiting heads 1½ to 1¾ in. broad; bracts lanceolate, the longer ones equaling or exceeding the head in maturity, 2 or 3 of the outer ones much shorter; achenes more or less serrulate-ribbed, attenuate above almost into a beak, dark brown to almost black, 4 to 6 lines long; pappus silvery white to tawny, 5 to 7 lines long, the very delicate awn ¼ to ½ the

length of the deeply notched linear paleae.—Open ground, hills and mesas, 200 to 4500 ft.: Coast Ranges from Humboldt Co. to Monterey Co. and s. to coastal S. Cal.; Sierra Nevada foothills (infrequent); Mohave and Colorado deserts; s. to L. Cal., e. to Nev. and N. Mex. Apr.-May. (Microseris linearifolia Gray.)

2. **U. lindleyi** Nutt. Scapes few to many, stout, 10 to 20 in. high, scarcely thickened under the head; leaves as in U. linearifolius but rather broader; longer bracts of involucre shorter than the head in maturity, lanceolate to oblong-attenuate, the outer short ones more numerous than in U. linearifolius; achenes brownish, 4½ to 5 lines long, slightly narrowed toward the summit; pappus dull brown or sordid, 6 to 7 lines long, the awn from a shallow notch and very little shorter than the paleae.—Open hills and valley fields, 200 to 1500 ft.: Napa Co. to Marin Co.; South Coast Ranges; Sierra Nevada foothills (infrequent); coastal S. Cal.; Mohave Desert; w. Colorado Desert; s. to L. Cal. Mar.-Apr. (Microseris lindleyi Gray.) Var. CLEVELÁNDII Jepson. Herbage scurfy-puberulent; achenes not at all attenuate; awn less than half as long as the paleae.—Sierra Nevada foothills (infrequent); San Joaquin Valley and s. to San Diego Co. (U. clevelandii Greene.) Var. LEUCOCÁRPUS Jepson n. comb. Achenes slender-attenuate toward summit, the seed not filling the narrow part; palea and awn each about 2½ to 3 lines long.—Santa Cruz Mts. from San Mateo Co. to Santa Clara Co. (U. leucocarpus Greene.)

9. SCORZONÉLLA Nutt.

Perennial herbs, the leaves basal or sub-basal, the stems branching a little above the base and bearing long naked one-headed peduncles. Root fusiform. Leaves pinnatifid with linear and mostly salient lobes, or entire. Heads ovoid-cylindric to hemispherical, nodding in the bud, showy, the flowers yellow and ligules elongated. Bracts of the involucre mostly thin-herbaceous, imbricate in several series. Receptacle naked. Achenes cylindric or slightly tapering downward, ribbed and often obscurely angled. Paleae 5 to 20, firm, tipped with a rather long often subplumose or barbellate awn. (So named because of the general aspect of Scorzonera.)

Pappus-bristles plumose to sub-plumose.
  Inner bracts of involucre linear-lanceolate; tips of outer bracts erect; pappus white; paleae 15 to 20 ..... 1. *S. nutans.*
  Inner bracts of involucre linear-oblong; acuminate tips of outer bracts tending to coil backward; pappus yellowish or sordid; paleae 5 to 10 ..... 2. *S. sylvatica.*
Pappus-bristles barbellate or naked.
  Paleae 5 to 10; leaves not undulate.
    Awns about 4 times as long as paleae; pappus sordid or brownish.
      Involucre 11 to 14 lines high, the outer bracts broadly ovate, abruptly acuminate ..... 3. *S. procera.*
      Involucre 8 lines high, the outer bracts lanceolate, gradually acuminate ..... 4. *S. paludosa.*
    Awns 7 or 8 times as long as paleae; pappus white ..... 5. *S. laciniata.*
  Paleae about 20; pappus bright white; leaves more or less undulate .. 6. *S. troximoides.*

1. **S. nùtans** Geyer. Stems 1 to several from the scaly crown of solitary or fascicled fusiform roots, erect, or erect from a somewhat decumbent base, slender, 4 to 18 in. high; leaves narrowly linear-lanceolate to spatulate-obovate or oblanceolate, 4 to 10 in. long, entire, or toothed or cleft into salient lobes, the lobes narrowly lanceolate to filiform, ¼ to 1¼ in. long; upper leaves few, smaller; peduncles long, slender, naked, 3 to 8 in. long; heads ¾ to 1 in. broad; involucres 6 to 7 lines high, in maturity equaling or exceeding the pappus; inner bracts linear-lanceolate, the outer ones lanceolate, short; achenes fusiform, 2½ to 3 lines long; pappus soft, white, 3 lines long, the 15 to 20 paleae narrowly oblong, ⅓ line long, white, tipped by a plumose bristle.—Open pine slopes, 4000 to 8000 ft.: Sierra Nevada from Tulare Co. to Modoc Co.; Humboldt Co. to Siskiyou Co.; n. to B. C., e. to Col. July. Var. LACINIÀTA Jepson n. comb. Leaves linear to almost filiform and entire, or pinnatifid into narrow segments; pappus-paleae ¾ line long.—Montane, 4000 to 8500 ft.: Sierra Nevada from Kings River to Sierra Co.; Humboldt Co. to Siskiyou Co. (Microseris major var. laciniata Gray.)

2. **S. sylvática** Benth. Stems 1 or several, simple or sparingly branched near the base, 1 to 2 ft. high, arising from a tuft of leaves and old leaf bases

on the root-crown; herbage densely mealy-puberulent to glabrous; leaves mostly basal, erect, linear-lanceolate to broadly lanceolate or oblong, laciniate-pinnatifid, rarely entire, undulate, narrowed to a margined base or petiole, the whole 2 to 9 in. long; heads 1½ to 2 in. broad; bracts of the involucre in 2 or 3 series, the inner linear-oblong, acuminate, 8 to 10 lines high, the outer ovate to lanceolate, shorter, the narrowly acuminate tip tending to coil backward; ligules light yellow with a pinkish median line; achenes linear, about 10-ribbed, 3 to 5 lines long; pappus sordid or brownish, 6 to 7 lines long; paleae about 7 (5 to 10), linear-attenuate, 2¾ to 3½ lines long, truncate or slightly cleft at apex, or sometimes obtuse, the awn subplumose, about 3½ lines long.—Open hillslopes or plains, 100 to 5000 ft.: Sacramento Valley; Sierra Nevada; Tehachapi Mts.; mts. on w. side Mohave Desert. (Microseris sylvatica Gray. M. parryi Gray. M. montana Greene.) Var. STILLMÁNII Jepson n. comb. Bristles not plumose, merely barbellate; achenes obscurely ribbed.—San Francisco; Pt. Reyes. (Microseris sylvatica var. stillmanii Gray.)

3. **S. prócera** Greene. Stems 1 or few, robust, 2 to 3½ ft. high, leafy, branched from above the base, the branches long, erect, and naked; herbage glabrous or more or less mealy-puberulent; leaves oblong-lanceolate to oblanceolate, entire, toothed or somewhat laciniate, ¾ to 1¼ ft. long, 1 to 2 in. wide, the upper cauline ones smaller, all acuminate and tipped with a short rigid point; heads 1½ to 2½ in. broad; involucres 11 to 14 lines high, as broad or broader; outer bracts roundish-ovate and abruptly short-pointed, the inner ovate to lanceolate, long attenuate; achenes 2 to 2½ lines long; pappus sordid, 5 to 6 lines long; paleae ovate, 1 to 1½ lines long; awn minutely barbellulate.—Valley floors or low hills, 300 to 1500 ft.: North Coast Ranges from Napa and Sonoma Cos. to Mendocino Co.; n. to Ore. Apr.-June. (S. maxima Bioletti.) Var. PRATÉNSIS Jepson n. comb. Leaves acuminate, entire (sometimes slightly toothed); achenes 2 lines long; pappus white, 4 lines long, the paleae oblong, ½ line long.—Grassy valley meadows, 3000 to 4000 ft.: Siskiyou Co. to Lassen Co. (S. pratensis Greene.)

4. **S. paludòsa** Greene. Stems several from the base, slender, 16 in. high or more; leaves ½ to 1 ft. long, subentire to laciniate-parted into long linear lobes; heads 50 to 75-flowered; involucres 8 lines high, the bracts with a lanceolate base, tapering into a long slender acumination; achene 2 to 3 lines long; pappus brownish, the lanceolate paleae little more than 1, the barbellulate awn 4 to 5 lines long.—Low moist ground: Marin Co. Var. INTEGRIFÒLIA Jepson n. var. Leaves linear-lanceolate, 3 to 6 in. long.—Monterey Co. (Pacific Grove, Heller 6732, type).

5. **S. laciniàta** Nutt. Stems slender, several from base, branching, 1½ to 2 ft. high; herbage minutely scurfy-puberulent or glabrous; leaves elongate, 1½ to 10 in. long, pinnately parted into long linear-attenuate segments ½ to 1¾ in. long; heads 1 to 1¾ in. broad; involucres 7 to 12 lines high, the outer bracts round-ovate to lanceolate, abruptly acuminate, the inner ones linear-lanceolate, attenuate; achenes 2 lines long; pappus white, 3½ lines long, the paleae ovate-lanceolate, less than ½ line long.—Wooded hillsides, 800 to 3500 ft.: Humboldt Co. to Siskiyou Co.; n. to Wash. July. Var. BOLÁNDERI Jepson n. comb. Herbage glabrous; leaves lanceolate to oblanceolate, entire or with a few salient linear lobes, 4 to 6½ in. long, or the upper cauline smaller; achenes 2 lines long; pappus white, 3½ to 4 lines long, the ovate palea about ½ line long.—Mendocino Co. to Humboldt Co.; Siskiyou Co.; Lassen Co. (Calais bolanderi Gray. S. arguta Drew.)

6. **S. troximoides** Jepson n. comb. Stems few from the scaly crown of a thick root, 6 to 8 in. high; herbage glabrous; leaves all basal, linear to lanceolate, attenuate, undulate, 2 to 5 in. long; heads 1½ in. broad; involucres 8 to 9 lines long, surpassed by the pappus at maturity; bracts linear-lanceolate, the outer more than half as long as the inner, all with a longitudinal black or dark midnerve; achenes fusiform, 3¾ to 4 lines long; pappus shining white, 5½ lines long; paleae 2½ to 3 lines long, narrowly linear, tapering into a short awn.—Lassen Co.; n. to Wash. and Mont. (Microseris troximoides Gray.)

SCORZONÈRA L. Ours perennial herbs with edible carrot-like roots. Heads borne on very long peduncles. Flowers yellow. Bracts imbricated in several series, the outer ovate, the inner lanceolate, all acuminate. Receptacle naked. Achenes many-ribbed, beakless. Pappus-bristles in several series, unequal, serrulate or more or less soft-hairy, some often longer and naked at the apex. S. HISPÁNICA L. Viper's Grass. Plants 2 to 3 ft. high; herbage glabrous and glaucous; leaves oblong, serrulate, tapering to a petiole at base, 1½ ft. long or less; heads in anthesis 2 in. in diameter, nodding in the bud.—Garden plant, native of Eur., adventive in low valleys: upper Napa Valley; Knights Valley; Ukiah Valley.

10. PÍCRIS L.

Coarse rough-bristly biennial with leafy stems. Heads short-peduncled, terminal or along the branches. Flowers yellow. Receptacle naked. Outer bracts of involucre loose and spreading, ovate, bristly-margined and spinescent at tip; inner bracts erect, linear-lanceolate. Achene somewhat flattened, transversely rugose, ours with a long and slender beak and bearing a pappus of densely plumose bristles. (Greek pikros, bitter.)

1. **P. echioides** L. BRISTLY OX-TONGUE. Stem branching, 1 to 3 ft. high, hispid with barbed hairs; leaves narrowly oblong or the lower oblanceolate, sessile, rough-hispid, 1 or 2 to 8 in. long; bracts of the outer involucre 5, subcordate at base; inner bracts long-acuminate, bearing just below the tip a spinose-pinnatifid bristle or appendage; achenes oblong, orange-color, 1½ lines long, rather abruptly passing into a beak as long or longer; pappus copious, white, 3½ lines long.—Nat. from Eur., a summer weed widely established in open fields and waste grounds: San Bernardino Valley; Los Gatos; Berkeley; Creston, Solano Co.; Cape Mendocino.

11. TRAGOPÒGON L.

Stout glabrous biennial or perennial herbs, somewhat succulent. Leaves grass-like, entire, clasping. Heads large, long-peduncled, opening in the early morning, usually closed by midday. Flowers in ours purple. Involucre narrowly campanulate. Involucral bracts in 1 series, nearly equal, lanceolate, acuminate, united at the very base. Receptacle naked. Achenes muricate, 5 to 10-ribbed, long-beaked or the outermost beakless. Pappus ample, its bristles long-plumose. (Greek tragos, a goat, and pogon, a beard.)

1. **T. porrifólius** L. SALSIFY. Stems from a stout taproot, very leafy at base, 2 to 4 ft. high; leaves linear-lanceolate, long-acuminate, 1 ft. long or more; peduncle thickened and hollow below the head; heads in fruit 2 to 2⅓ in. high; flowers deep purple; achenes cylindric, ½ in. long, the beak nearly twice as long; pappus brownish, ¾ in. long.—Nat. from Eur.: Yreka; Ft. Bidwell; Honey Lake Valley; Berkeley; Ross Valley; Ballona, Los Angeles Co.

12. RAFINÉSQUIA Nutt.

Stout leafy glabrous branching annuals. Leaves toothed or pinnatifid. Inflorescence more or less corymbosely branching. Heads 15 to 30-flowered. Involucre in anthesis conical-cylindraceous. Flowers white, the ligules unequal. Receptacle naked. Achenes with a few obscure ribs, tapering into a slender beak, excavated at the insertion, but without callous thickening. Pappus-bristles capillary, 10 to 15, long-plumose from the base to near the tip. (C. S. Rafinesque, 1783-1840, American naturalist, celebrated for his genius and eccentricity.)

Body of achene 2 to 2½ lines long, about as long as the slender beak; plume of pappus not matted; involucre 7 to 9 lines high.....1. *R. californica.*
Body of achene 4 to 5 lines long, about twice as long as the thickish beak; plume of pappus matted; involucre 10 to 13 lines high.....2. *R. neomexicana.*

1. **R. californica** Nutt. Stem erect, robust, sometimes almost fistulous below, branching above, 1½ to 5½ ft. high; leaves oblong to round-ovate in outline, 1 to 6 in. long, pinnately cleft or parted into narrow toothed segments to merely denticulate or almost entire, sessile and auriculate-clasping

or the lowermost narrowed to a winged petiole, those of the inflorescence many, reduced to herbaceous bracts; heads in anthesis ¾ to 1½ in. broad; involucres subcylindric, 6 to 9 lines high, the main bracts 11 to 15, linear or lanceolate-acuminate, and with some loose subulate ones at base; achenes pubescent to glabrate, tuberculate, 2 to 2½ lines long, tapering into a filiform beak of about equal length; pappus white or brownish tinged, 3 to 4 lines long.—Shady or moist places in the hill country, 500 to 2000 ft.: Coast Ranges from Humboldt Co. s.; s. Sierra Nevada in Kern Co.; coastal S. Cal.; Mohave and Colorado deserts. Apr.

2. **R. neoméxicàna** Gray. Stem widely branching or sometimes simple and erect, ½ to 2 ft. high; herbage at first glaucous; lower leaves narrowly to broadly oblong in outline, ¾ to 4½ in. long, pinnately and often saliently or runcinately lobed to merely toothed, the uppermost reduced to minute usually spinulose bracts, all but the lowest with auriculate-clasping base; heads 1 to 1¼ in. broad; involucres subcylindric, 10 to 13 lines high, the main bracts 8 to 10, linear-lanceolate, with some loose subulate ones at base; ligules pure white, veined on the back with brown-purple; achenes obscurely tuberculate, often mottled, 4 to 5 lines long, tapering into a thickish beak nearly ½ as long; pappus white, 5 to 6 lines long, the plume somewhat matted. —Desert mesas, common among bushes, 500 to 2000 ft.: Inyo Co.; Mohave and Colorado deserts; e. to Ariz., s. to Mex. Apr.-May.

13. HYPOCHOÈRIS L.

Herbs. Stems naked, bearing a solitary head or a somewhat corymbose cluster of long-peduncled heads. Flowers yellow. Leaves in a basal cluster or rosette, toothed or pinnatifid. Involucre campanulate or cylindrical, its bracts rather few, lanceolate, imbricated, appressed, the outer ones successively shorter. Bracts of the receptacle scarious, thin and narrow. Achenes glabrous, upwardly scabrous, the body 10-ribbed, narrowly oblong or fusiform, all tapering upward into a slender beak, or the outermost truncate. Pappus of plumose bristles, some of the outer often shorter and naked. (Greek name used by Theophrastus for some cichoriaceous plant.)

Annual; heads 2 to 3 lines broad; outermost achenes beakless, truncate at summit..... 1. *H. glabra.*

Perennial; heads 1 to 1¾ in. broad; achenes all beaked.....2. *H. radicata.*

1. **H. glàbra** L. Smooth Cat's-ear. Glabrous annual; stems few to several, erect, simple or mostly corymbosely branched, 4 to 16 in. high; leaves spatulate-oblong, denticulate or broadly toothed to sinuately pinnatifid, ½ to 5 in. long; heads campanulate; involucres 6 to 8 lines long, the ligules scarcely exceeding them; achenes dark brown, the outermost truncate at summit, 1¾ lines long, the others prolonged into a slender beak as long as the body of the achene; pappus 4½ lines long, yellowish or brownish tinged. —Nat. weed from Eur., in cultivated fields and pasture lands, valleys and foothills along the coast, foothills of the interior, almost throughout cismontane Cal.

2. **H. radicàta** L. Hairy Cat's-ear. Stems several, often thickening upward, 1 to 2 ft. high, from a fleshy perennial root; leaves spatulate, hispid with spreading hairs, merely dentate, or pinnatifid below the large terminal lobe into oblong obtuse lobes, 2½ to 5½ in. long; rays longer than the involucre, which is disposed to twist slightly after anthesis; achenes brown, the body 1¾ lines long, the beak as long or longer.—Nat. weed from Eur., valleys and hill slopes near the sea, abundant from Humboldt Co. to Monterey Co.

14. STÉPHANOMÈRIA Nutt.

Usually tall and rather slender annual or perennial herbs, paniculately branching above. Leaves runcinate or entire, often reduced above to herbaceous bracts. Heads small, 3 to 20-flowered. Flowers pink or flesh-color, open in the early morning, the ligules all equal. Involucre cylindrical or rarely campanulate, its inner bracts linear and equal, with some short usually calyculate outer ones. Receptacle naked. Achenes oblong, short-linear or clavate, strongly angled, glabrous, often rugose, truncate at both ends, the

broad base hollowed at the insertion. Pappus-bristles white or brownish, plumose. (Greek stephane, a wreath, and meros, a division, perhaps referring to the virgate branches.)

Receptacle deeply pitted, fimbrillate or scaly; involucre imbricated; root perennial; young herbage woolly; achenes not tuberculate nor rugose.....1. *S. cichoriacea.*
Receptacle naked; involucre not imbricated but calyculate at base with small or minute bracts, rarely 1 or 2 intermediate bracts; herbage commonly glabrous.
Perennials; achenes not tuberculate nor rugose.
Stems from slender creeping rootstocks, very leafy; leaves mostly linear, thin, entire or with a few salient teeth, few if any of the leaves bract-like.... 2. *S. lactucina.*
Stems from the crown of a deep-seated taproot; leaves of the branchlets commonly small or minute and bract-like.
Leaves callus-margined; stem leafy, the leaves oblong, thick, runcinate-pinnatifid .....3. *S. parryi.*
Leaves not callus-margined; stems moderately or sparsely leafy.
Leaves mostly filiform and entire; branches flexuous, ascending..... 4. *S. tenuifolia.*
Leaves linear-subulate, mostly runcinate, those of the branchlets reduced and scale-like; branches mostly rigid and conspicuously divaricate (except in var. myrioclada).....5. *S. runcinata.*
Annuals or biennials; achenes usually tuberculate or rugose.
Pappus plumose almost throughout, the base scarcely thickened; herbage glabrous or nearly so.....6. *S. virgata.*
Pappus plumose only above, the naked base thickened or paleaceous, often toothed or giving off short secondary bristles; branchlets more or less glandular-pubescent .....7. S. *exigua.*

1. **S. cichoriàcea** Gray. Stems erect, simple or virgately branched, 1½ to 5 ft. high, few or several from a large woody perennial root; herbage silvery with a close thin tomentum, becoming glabrate; leaves oblong to oblong-lanceolate or lanceolate, acute, remotely and saliently toothed to entire, sessile, 1½ to 8 in. long; heads large for the genus (8 to 10 lines broad), sessile and racemose along the elongated branches, rarely on short peduncles; involucres 6 to 7 lines high, the inner bracts linear, the outer lanceolate, shorter, imbricated; receptacle pitted, the pits bordered with short narrow thin scales; achenes smooth, 5 to 8-nerved, 2½ to 3 lines long; pappus sordid or fuscous, 3½ lines long, the 12 to 22 bristles plumose throughout.—Rocky places in cañons, 1000 to 5000 ft.: Santa Ana, San Gabriel, San Bernardino mountains and n. to Tejon Pass; Santa Barbara Isls. Aug.

2. **S. lactùcina** Gray. Stem erect, leafy, 3 to 15 in. high, arising from a slender creeping rootstock, freely branched at or near the base, the branches slender, spreading or divaricate, or sometimes the stem strictly erect with ascending branches at the middle or above; leaves linear, or a few linear-spatulate, entire, or with a few salient teeth, 1 to 4½ in. long; heads about 8-flowered, terminal on the mostly naked corymbose branchlets or peduncles, or sometimes racemosely arranged; involucres 5 to 6 lines high, the main bracts linear-attenuate, the outer short, lanceolate; ligules pink, well exserted; achenes somewhat angled, smooth, 2½ to 3 lines long; pappus white, 4 lines long, of about 20 or 21 bristles plumose nearly to the base, the bases thickened or more or less united.—Montane ridges, flats or plateaus, often in open pine forest, 4000 to 7000 ft.: Mariposa Co. to Siskiyou and Modoc Cos. July-Aug.

3. **S. párryi** Gray. Stems several from a perennial root, erect or spreading, ing, often much branched, 5 to 8 in. (or to 2 ft.) high; herbage glabrous, glaucescent; leaves oblong, thickish, runcinate-pinnatifid, callous-margined, 1 to 2 in. long; leaves of the branchlets minute, ovate to orbicular, entire or somewhat spinulose-lobed; heads terminal on the branchlets; involucres 5 to 6 lines high, the inner bracts linear, the outer ones very short; corollas white; achenes smooth with slender ribs; pappus sordid, 4 to 4½ lines long, often united in 2s or 3s at base, the lower ⅕ naked.—Mesas or arid slopes of ranges bordering or in the deserts, 3000 to 5000 ft.: n. Colorado Desert; Mohave Desert; Inyo Co.; e. to Utah and Ariz. May-June.

4. **S. tenuifòlia** (Torr.) Hall. Stems few or several from a woody root-crown, erect, with numerous ascending slender branches, 8 to 15 in. high; herbage usually light green, glabrous; leaves filiform, ½ to 1½ in. long, entire, or the basal somewhat toothed; heads terminal on the branchlets; in-

volucres 4 to 5 lines high, about 5-flowered, its main bracts about 5; achenes about 10-striate; pappus bristles about 15 to 23, white or sordid, plumose throughout.—Montane slopes, 4000 to 7000 ft.: e. side or easterly parts of the Sierra Nevada from Tulare and Inyo Cos. northward; w. slope Sierra Nevada, infrequent (Huntington Lake; Indian Valley, Plumas Co.); n. to eastern Ore., Ida. and Mont. July-Aug. (S. minor Nutt.)

5. **S. runcinàta** Nutt. Stems slender, woody below, much branched, the nearly leafless and slender branches divaricate or slightly ascending, forming rounded bushy plants 1 to 2 ft high, with deep-seated perennial roots; herbage pale, glaucescent, glabrous; leaves linear, subulate, entire, or runcinately pinnatifid or toothed, ¾ to 1½ in. long, or the upper leaves minute and scale-like; branchlets a little curved at apex, bearing a single terminal head; involucres 3 to 4 lines high, the 5 inner bracts linear, obtuse, the outermost calyculate; achenes 5-angled, 1¾ to 2 lines long; pappus brownish-tinged, plumose to near the somewhat thickened base, or the lower ¼ or ⅓ glabrous, 2 to 2½ lines long.—Desert flats and mesas, 500 to 2500 ft.: Colorado and Mohave deserts; Inyo Co.; e. to N. Mex., s. to L. Cal. May-June. Var. MYRIÓCLADA Jepson n. comb. Branches very slender, ascending; heads often only 3 or 4-flowered; bracts of the involucre sometimes only 3 or 4.—San Gabriel Mts.; Mohave Desert; e. to Nev. (S. myrioclada Eat.) Var. PARÍSHII Jepson n. var. Herbage covered with a grayish hispidulous tomentum; pappus-bristles plumose to the thickened or somewhat united bases.—Sw. Mohave Desert (Victorville, Parish 10,615, type).

6. **S. virgàta** Benth. Stem erect, virgate or with virgate branches, 1 to 4 ft. high; herbage glabrous or somewhat puberulent; inflorescence nonglandular, sometimes glandular; leaves oblong or spatulate, often sinuate or pinnatifid, 1¼ to 6 in. long, the upper cauline ones linear, entire; heads 4 to 8 (or to 22)-flowered, subsessile along the naked virgate branches; involucres 3 lines high; flowers pink; achenes subclavate or oblong, 5-angled, irregularly rugose-tuberculate between the angles, 1¾ to 2 lines long; pappus clear white or faintly brownish-tinged, plumose almost throughout, 2 to 2½ lines long, often deciduous.—Dry hills and valleys, 200 to 6000 ft.: throughout cismontane Cal.; e. to Utah, n. to Ore. Sept.-Oct. (Ptiloria pleurocarpa Greene.)

S. TOMENTÒSA Greene. Herbage white-tomentose when young.—Santa Cruz Isl.

7. **S. exígua** Nutt. Stems stout, much branched at or near base, the branches ascending or spreading, ½ to 4 ft. high; branchlets with very short scattered gland-tipped hairs, commonly glabrous below; lower leaves narrowly oblong or lanceolate, remotely lobed, auriculate-clasping, 1 to 2 in. long, the upper small and bract-like, rather numerous on the branchlets and peduncles; heads numerous, few-flowered; involucres 2½ to 3½ lines high, the ligules much exserted; main bracts about 5, linear-attenuate, the outer ones short, ovate; achenes 5-angled, each of the 5 sides (between the angles) bearing 2 rows of tubercles, each row separated from its companion row by a very narrow channel, about 1 line long; pappus white, the 5 to 18 bristles plumose only on upper ½ or ⅘, 1½ lines long; bases of bristles short-setulose on each side, the setae persistent after the bristles have fallen.—Valley flats and low hills, 1000 to 3000 ft.: coastal S. Cal.; Mohave Desert; n. along e. side Sierra Nevada and far ne. to Wyo.; e. to Tex. Var. PENTACHAÈTA Hall. Herbage glabrous, not glandular; pappus-bristles reduced to 5 (or 7), plumose only on upper half.—More or less with the species. (S. pentachaeta Eat.) Var. CORONÀRIA Jepson n. comb. Peduncles usually shorter (as in S. virgata); herbage less glandular or sometimes not at all so; pappus-bristles deciduous above the paleaceous base, leaving a crown of setose scales.—Coast Ranges; coastal S. Cal.; s. Sierra Nevada; Inyo Co. (S. coronaria Greene.)

15. **ANISÒCOMA** Gray

Low annual with few to many naked scapes, each bearing a single head and arising from a basal rosette of leaves. Involucre cylindric, the inner

bracts linear, acute, the outer successively oblong, short-oval or orbicular, obtuse, all white-scarious with a broad green midrib. Bracts of the receptacle linear, scarious, persistent. Achenes linear-turbinate, 10 to 15-nerved, truncate, crowned with a narrow entire border, villous. Pappus bright silky white, consisting of 8 to 12 long-plumose bristles; bristles of 2 lengths, disposed in one circle, but the short ones set on one side the flower, the long ones on the other. (Greek anisos, unequal, and kome, tuft of hair, the two sets of pappus bristles unlike.)

1. **A. acaùlis** Gray. Scapes stout, 2 to 10 in. high; leaves oblong, pinnately toothed or parted into toothed segments (the margins commonly with tufts of wool), 1 to 2 (or 3) in. long; heads ¾ to 1¼ in. broad; involucres cylindric-campanulate, ¾ to 1½ in. high; bracts often spotted with dark dots; ligules yellow, often pinkish tinged; bracts of receptacle 5 lines long; achenes 2 lines long; pappus 11 lines long, the bristles on inner side of the achene commonly 4 or 5, shorter than the outer ones; outer bristles commonly 5 or 6, geniculate towards the base.—Arid mountain slopes or sandy washes, 4000 to 7800 ft.: San Jacinto Mts.; Mohave Desert; Mt. Pinos; Tehachapi Mts.; Argus Mts. Apr.-June.

16. **LACTÙCA** L. Lettuce

Tall leafy-stemmed annuals or biennials with paniculed heads of yellow or purple flowers. Leaves alternate. Involucre cylindrical or in fruit conical, its bracts imbricated in 2 or more series of unequal lengths. Receptacle naked. Achenes obcompressed, that is, flattened parallel to the bracts, ribbed on each side, contracted into a beak, which bears at its dilated summit a copious very soft and white capillary pappus, the hairs of which fall separately. (Ancient Latin, from lac, milk, referring to the milky juice.)

Annual or biennial; achenes margined, abruptly beaked, the beak about as long as the body or a little longer; flowers yellow.
Achenes several-nerved; leaves mostly clasping by a broad sagittate base..... 1. *L. scariola.*
Achenes 1-nerved on each face (sometimes with obscure nerves near the margin).
Leaves narrow at base, sessile or narrowly sagittate-clasping, the midrib not prickly; pappus 2½ to 3 lines long.....2. *L. canadensis.*
Leaves with broad sagittate-clasping base, the midrib more or less prickly below; pappus 3½ to 4½ lines long.....3. *L. ludoviciana.*
Perennial; achenes marginless, tapering to a very short beak about as long as the breadth of the body; flowers purple.....4. *L. pulchella.*

1. **L. scarìola** L. Prickly Lettuce. Stem erect, simple, paniculately branched above, glabrous throughout, or hirsute or prickly below, 2 to 5 ft. high; leaves oblong or oblong-lanceolate, spinose-denticulate, pinnatifid, sessile or sagittate-clasping, 1½ to 7 in. long, with a row of soft prickles on the lower side of the midrib; heads numerous in an open panicle, 9 to 14-flowered; involucres cylindrical, 5 to 6 lines long, the outer bracts about ⅓ as long as the inner; ligules cream-yellow; achenes narrowly obovate, several-nerved, dark olive green, pubescent above, 1¾ to 2 lines long, the nerves minutely roughened; beak filiform, about as long or a little longer than the body; pappus white, 2 to 2½ lines long.—Nat. from Eur., a weed in waste places and fields throughout the valleys of Cal. Var. integràta Gren. & Godr. Leaves oblong-oblanceolate, merely spinose-denticulate, 2 to 6 in. long; flowers yellow (or purplish).—Nat. from Eur.: Santa Clara, Alameda, Humboldt and Siskiyou Cos.

2. **L. canadénsis** L. Trumpet Fireweed. Stem simple, erect, leafy, 3 to 4 ft. high; herbage glabrous; leaves 2 to 9 in. long, pinnately parted into salient oblong segments, 1 to 1½ in. long; panicle ample or elongate; involucres 4 to 5 lines high; flowers pale yellow; achenes oblong-ovate, blackish, transversely striulate, 1-nerved on each face, 1¼ to 1¾ lines long, the beak about ⅓ as long; pappus 2½ to 3 lines long.—Introduced from the e. U. S.: Sisson; Fall River Lake, Shasta Co.; Sierra Valley.

3. **L. ludoviciàna** DC. Stem stout, simple, erect, leafy, 3 to 4½ ft. high; herbage glabrous, the midrib of leaves more or less prickly below on the under side; leaves 2½ to 4 in. long, mostly broadly oblong, irregularly dentate or sinuately pinnatifid into broad denticulate segments, the terminal segment largest; panicle ample; involucres 6 to 8 lines high; flowers yellow;

achenes oblong-ovate, margined, 1-nerved on each side, transversely striulate, dark brown or somewhat mottled, 1½ to 2 lines long, narrowing abruptly into a slender beak nearly as long; pappus 3½ to 4½ lines long.—Introduced from e. U. S.: Fall River Lake, Shasta Co.

4. **L. pulchélla** DC. Stem simple, erect, very leafy, 1¼ to 3 ft. high, ending above in a few to many-flowered panicle; herbage glabrous, glaucescent; leaves linear to linear-lanceolate or oblong-lanceolate, entire to runcinate-dentate or pinnatifid, sessile or with a winged petiole, 2 to 6 in. long; branches of the panicle with small scaly bracts; involucres 5 to 7 lines high; flowers blue or purple, the ligules well exserted; achenes oblong with a very short beak, 1½ lines long; pappus 4 lines long.—Montane valleys of the Sierra Nevada, 3400 to 6000 ft., mostly on the east side, from Mono Co. to Modoc Co.: Mono Lake; Hetch-Hetchy; Modoc lava beds; Ft. Bidwell; e. to Nev. and Mich., n. to B. C. June-July.

17. SÓNCHUS L. Sow-thistle

Leafy-stemmed coarse annual or perennial weeds, smooth and glaucous, or the peduncles and upper parts of the stem glandular-hispid. Heads corymbed or umbellate, swollen at base or jug-shaped. Involucral bracts thin, the inner linear-attenuate, with many shorter ones at base, these usually becoming callous-thickened. Receptacle naked. Achenes obcompressed, ribbed or striate, not beaked. Pappus copious, of cottony-white exceedingly soft and fine hairs, mainly falling together. (Greek name of the sow-thistle.)

Leaves when sessile usually sagittate-clasping; peduncles glabrous or sometimes with a few gland-tipped hairs; achenes transversely rugose; annual.
- Achenes longitudinally ribbed; leaves lyrately or runcinately pinnatifid, the terminal segment large and triangular ..... 1. *S. oleraceus.*
- Achenes longitudinally striate; leaves pinnately parted into linear or lanceolate lobes or merely denticulate ..... 2. *S. tenerrimus.*

Leaves when sessile usually auriculate-clasping; peduncles hispid with short spreading gland-tipped hairs or entirely glabrous.
- Annual; achenes flat, oblong-obovate, with 3 longitudinal ribs on each side, the intervals smooth or nearly so ..... 3. *S. asper.*
- Perennial; achenes oblong with 5 ribs on each side, the middle one forming a keel, both ribs and intervals rugulose ..... 4. *S. arvensis.*

1. **S. oleràceus** L. Common Sow-thistle. Hare's Lettuce. Stem erect, nearly simple, 1 to 4 ft. high; leaves 3 to 12 in. long, lyrately or runcinately pinnatifid, denticulate or toothed, the terminal segment commonly large and triangular, sagittately clasping at base with acute lobes; lowest leaves petioled, the uppermost ones commonly lanceolate, sessile; achenes obovate, longitudinally ribbed and transversely rugose, 1 to 1½ lines long; pappus 3 to 4 lines long.—Nat. from Eur.: waste lands in the valleys and hills throughout Cal.

2. **S. tenérrimus** L. Stem much branched, ⅓ to 3½ ft. high, very leafy up to the short-peduncled heads; herbage glabrous; leaves oblong in outline, 3 to 7 in. long, pinnately parted or divided into linear or narrowly lanceolate lobes, the lobes ¾ to 2½ in. long, commonly cuspidate and either spinulosely denticulate or entire, or sometimes the leaves undivided; achenes narrow, longitudinally striate and transversely rugose, 1 line long; pappus 2 to 3 lines long.—Nat. from Eur.: w. San Diego Co.; Santa Barbara Isls.; s. to L. Cal.

3. **S. ásper** L. Prickly Sow-thistle. Very similar to no. 1, the leaves divided or sometimes undivided, commonly clasping by an auricled base, the auricles rounded, the teeth longer and more prickly; upper part of stem and peduncles furnished with spreading gland-tipped hairs, or these parts entirely glabrous; achenes flat, oblong-obovate, margined with a narrow wing and marked on each side with 3 longitudinal ribs; intervals between the ribs smooth, or nearly so, the ribs as well as the marginal wing rugulose or serrulate.—Nat. from Eur.: waste lands in valleys throughout Cal. It is often associated with S. oleraceus and there are hybrid-like intermediates.

4. **S. arvénsis** L. Corn Sow-thistle. Stem slender, branched above, arising from creeping rootstocks, terminating in a corymbose panicle, 2 to 2½ ft. high; leaves runcinate-pinnatifid or some undivided, spinose-toothed, petioled or auriculate-clasping, 1 to 10 in. long; peduncles more or less gland-

ular-bristly; involucres 5 to 8 lines high; achenes oblong, 1½ lines long, flattish, bordered by a marginal rib and also 5-ribbed in each side, the middle rib forming a keel, all the ribs transversely rugulose; pappus 4 to 5 lines long.—Nat. from Eur.: Santa Ana.

18. **MALACÓTHRIX** DC.

Herbs or sometimes woody at base. Leaves all basal and the stems scapose, or the stems leafy. Heads peduncled, commonly nodding in the bud. Flowers yellow, white, or pinkish. Receptacle bristly or naked. Achenes short, glabrous, terete, 10 to 15-ribbed, or 4 or 5 of the ribs stronger than the others, truncate at apex and with an entire or denticulate border. Pappus-bristles soft, scabrous, more or less united at base and falling away together, or with 1 to 4 stronger ones which are more persistent and smoother. (Greek malakos, soft, and thrix, hair, in reference to the long wool on M. californica, type of the genus.)

Bracts orbicular or ovate to linear, very obtuse, silvery-scarious with a broad dark median line, imbricated in several series; receptacle with slender persistent bristles; persistent pappus-bristles 1 to 4 ..... 1. *M. coulteri.*
Bracts lanceolate to linear, only sparingly imbricated; receptacle with few deciduous bristles or none.
  Annuals (or M. altissima sometimes biennial).
    Plants less than 2 ft. high.
      Persistent pappus-bristles 1 or 2; leaves or their lobes narrowly linear to filiform, elongated.
        Stems scapose, the scapes simple or commonly so, one-headed; leaves all basal; persistent pappus-bristles 2; heads large, the outer ligules 7 to 10 lines long ..... 2. *M. californica.*
        Stems freely branched, bearing many or numerous heads; leaves mainly basal, some cauline; persistent pappus-bristle 1; heads small, the outer ligules 2½ to 3 lines long ..... 3. *M. clevelandii.*
      Persistent pappus-bristles none.
        Margins of leaves with tufts of white wool ..... 4. *M. obtusa.*
        Margins of leaves without tufts of wool.
          Stems sparsely leafy; desert species ..... 5. *M. sonchoides.*
          Stems densely leafy throughout; insular or coast species.
            Involucre 5 to 6 lines high; leaves and their lobes acute ..... 6. *M. foliosa.*
            Involucre 2½ to 3 lines high; leaves with their lobes mostly obtuse ..... 7. *M. indecora.*
    Plants more than 2 (usually 3 to 6) ft. high ..... 8. *M. altissima.*
  Perennials, wholly herbaceous or woody at base; persistent pappus-bristles none; south coast.
    Herbage essentially glabrous; involucral bracts linear-lanceolate, attenuate ..... 9. *M. saxatilis.*
    Herbage densely white-tomentose when young; involucral bracts obtuse, often purplish or pinkish ..... 10. *M. incana.*

1. **M. còulteri** Gray. SNAKE'S HEAD. Stem branching at or above the base, 5 to 14 in. high, the branches bearing mostly single heads; herbage glabrous and glaucescent; basal and lower cauline leaves narrowly oblong, sinuately pinnatifid or toothed, or dentate, 2 to 4 in. long; upper cauline leaves ovate to lanceolate or oblong, irregularly toothed or shallowly pinnatifid, sessile with an auricled or broad base, ½ to 3 in. long; heads subglobose, ¾ to 1¼ in. broad; involucres 4 to 7 lines high; bracts silvery-scarious, the linear central portion green (changing to brown), regularly imbricated in several ranks, the short outer ones orbicular, the inner oval to lanceolate or linear; achenes 4 or 5-angled, 15-ribbed, 1 line long, the summit obscurely denticulate by projection of the ribs; pappus white or faintly tawny, with 1 to 4 stouter pappus-bristles persistent.—Sandy valleys, 500 to 7400 ft.: coastal S. Cal.; upper San Joaquin Valley; Mohave Desert; Inyo Co. Mar.-May. Var. COGNÀTA Jepson n. var. Leaves pinnately parted into remote linear-lanceolate divisions.—Santa Cruz Isl. (T. Brandegee, type).

2. **M. califórnica** DC. Stems scapose, few to many, diffuse or erect, one-headed, 3½ to 12 in. high, the leaves all basal; herbage remarkably woolly when young, glabrate in age or the wool somewhat persistent on the involucre and often in conspicuous tufts among the leaf bases; leaves laciniately pinnatifid into narrowly linear or almost filiform lobes, 2 to 6 in. long; heads 1 to 1¾ in. broad; involucres 4 to 6½ lines high, their bracts narrowly linear or subulate, in about 3 ranks; bristles of the receptacle delicate, usually

present; flowers canary yellow; achenes narrow, lightly striate, 1¼ lines long; pappus white or faintly tawny, the outer of 2 persistent bristles and some intervening minute teeth.—Sandy soil, valleys and mesas, 20 to 4500 ft.: Contra Costa Co. to San Luis Obispo Co.; s. Sierra Nevada in Tulare and Kern Cos.; coastal S. Cal.; Inyo Co. Apr.-June. Var. GLABRÀTA Eat. Stems usually branched above and bearing several heads; herbage glabrous, except the outer calyculate bracts of the involucre, these sometimes canescently pubescent.—San Bernardino Valley; Riverside; Lakeside; Colorado and Mohave deserts; upper San Joaquin Valley; n. along e. side Sierra Nevada to Lassen Co.; e. to Nev., n. to Ore. (M. glabrata Gray.)

3. **M. clevelándii** Gray. Stems several to many from the base, erect or ascending, slender, often much branched, 5 to 16 in. high, the leaves mainly in a basal tuft, the cauline few and often reduced; herbage glabrous throughout; basal leaves linear, remotely pinnatifid, 1 to 3 in. long; cauline leaves scattered, pinnately toothed, denticulate or entire; heads 2½ to 3 lines broad, few-flowered; involucres 2½ to 3 lines high; bracts linear, the main ones in one rank, the shorter ones somewhat calyculate, in 1 or 2 ranks; corollas yellow; achenes linear, minutely striate-costate, ½ to 1 line long; pappus white, mostly deciduous except one persistent bristle and a circle of white setulose teeth.—Open hill or chaparral slopes, 500 to 5000 ft.: common in coastal S. Cal.; infrequent in Sierra Nevada foothills; Lake Co. May-June.

915. Malacothrix obtusa Benth.; *a*, habit x ½; *b*, achene and pappus x 4.

4. **M. obtùsa** Benth. Fig. 915. Stems 1 to several from base, paniculately branching, 4 to 16 in. high, almost naked, the leaves nearly all basal; basal leaves oblong, dentate or dentate-pinnatifid, ½ to 3(or 5) in. long, the margin commonly bearing scattered tufts of wool; heads 4 to 7 lines broad, numerous; involucres 2 to 3 lines high, their main bracts linear, acuminate, nearly equal, with a few short ones at base, the tips often purplish; corollas pale yellow or white, often pinkish-tinged, 3½ to 5 lines long; achenes obovate-oblong, the summit entire, ¾ line long; persistent pappus-bristles none.—Gravelly slopes or loose soil of hillslopes, 500 to 6000 ft.: Santa Barbara Co.; Mt. Pinos; Coast Ranges from San Benito Co. to Siskiyou Co.; Sierra Nevada from Mariposa Co. to Lassen Co. June-July.

5. **M. sonchoides** T. & G. Stems several from base, ascending, 4 to 11 in. high, freely branching, the leaves chiefly basal, the cauline few and scattered and often reduced; herbage glabrous or early glabrate; basal leaves oblong, sinuately pinnatifid with callus-toothed lobes, 1½ to 6 in. long; cauline leaves ½ to 2 in. long; heads 7 to 12 lines broad; involucres about 3 to 4 lines high; bracts linear-acuminate, in about 4 series; flowers fragrant; corollas very bright yellow; achenes 15-striate with 5 of the ribs stronger, ¾ line long, the summit 15-denticulate; persistent pappus-bristles none.—Sandy valleys, 2000 to 5000 ft.: Mohave Desert; Inyo Co.; e. to Ariz., n. to Nev. June.

6. **M. foliòsa** Gray. Stem erect, much branched above, very leafy nearly to the yellow-flowered heads, ½ to 2 ft. high, arising from an annual root; herbage glabrous; leaves mostly lanceolate, laciniate-pinnatifid, 2 to 4 in. long, the uppermost reduced; heads numerous, short-peduncled; involucres

5 to 6 lines high; achenes obscurely 5-angled and 2 or 3-striate between the angles; pappus all deciduous, leaving neither bristles nor crown.—San Clemente and Santa Cruz Isls.

7. **M. indécora** Greene. Stems several, sometimes diffuse and forming mats 6 in. or less thick, sometimes erect, slender, 4 to 15 in. high; leaves very thick and succulent, oblong to oblanceolate, pinnately lobed, the lobes mostly obtuse; involucres 2½ to 3 lines high, imbricate; inner bracts linear-lanceolate, green, the outer ones said to be purplish; corollas greenish-yellow, not exceeding the bracts; achenes 5-angled and 2 or 3-striate between the angles, about ¾ line long; pappus all deciduous.—Santa Cruz, San Miguel and San Nicolas Isls.

8. **M. altíssima** Greene. Stem stout, erect, herbaceous, simple below, strict and cymosely branched above, 2½ to 6 ft. high, arising from an annual or biennial very long and stout taproot; herbage tomentulose or glabrate; leaves oblong to lanceolate or linear-attenuate, entire or the lower somewhat toothed to parted, 1 to 4 in. long; heads ¾ to 1 (or 2) in. broad; involucres 3½ to 4½ lines high; bracts in about 4 series, the inner linear-attenuate, the outer short, subulate, passing into the bracts of the peduncle; flowers white or purplish; achenes linear, 1 line long, pubescent with minute short spreading hairs, the sides with 5 strong ribs and 5 to 10 faint intermediate ribs; pappus-bristles deciduous, leaving a narrow white denticulate border.—Tehachapi Range; n. San Luis Obispo Co. June-Aug.

9. **M. saxátilis** (Nutt.) T. & G. Stems 1 or several from the root-crown, stout, erect, diffuse or decumbent, wholly herbaceous, branched above, densely leafy, ½ to 2 (or 4) ft. high; herbage somewhat succulent, tomentulose to glabrate; leaves linear-lanceolate, entire or some of the lower coarsely toothed or pinnatifid, 1 to 5½ in. long; heads ¾ to 1¾ in. broad; involucres 5 to 7 lines high; bracts in 3 or 4 series, linear-lanceolate, attenuate; corollas white or pinkish; achenes 10 to 15-ribbed, 5 of the ribs stronger than the others, the summit obscurely denticulate; persistent pappus-bristles none.—Along the seacoast: Santa Barbara Co.; Santa Catalina Isl. Var. TENUIFÒLIA Gray. Herbage not succulent; leaves narrowly linear to filiform, entire.—Santa Barbara Co. to Orange Co. Var. IMPLICÀTA Hall. Stems becoming woody, branching, 5 to 8 in. high, densely leafy above, more or less roughened below by the persistent bases of old leaves; leaves bipinnately parted into filiform or narrowly linear segments, ¾ to 2 in. long; flowers purplish-tinged.—Santa Barbara Isls. (M. implicata Eastw.)

10. **M. incàna** T. & G. Stems several from the woody crown of a stout taproot, ascending, branching, densely leafy, 4 to 13 in. high; herbage when young clothed with a dense felt-like white tomentum, the tomentum more or less completely deciduous in age; leaves oblanceolate, tapering to a long narrow base, 1 to 4 in. long, entire to irregularly and shallowly lobed, or the cauline cleft or sometimes parted into remote linear or acute segments; heads ½ to 1¼ in. broad; involucres 5½ to 7 lines high; bracts in about 4 series, often pinkish or purplish, the inner equal, linear-oblong, obtuse, the outer short, ovate, imbricated, passing into the scale-like bracts of the peduncle; corollas lemon-yellow; achenes oblong, 15-striate, ¾ line long; pappus-bristles all deciduous.—Along the seacoast: San Luis Obispo Co.; Santa Barbara Co.; Santa Rosa Isl. May-Nov. (M. succulenta Elmer.)

19. APARGÍDIUM T. & G.

Slender glabrous perennial herbs with naked 1-headed scapes and linear-lanceolate leaves in a basal tuft from branching rootstocks. Heads nodding in bud, medium-sized. Involucre narrowly campanulate, the bracts lanceolate, acuminate, in several series. Flowers yellow. Receptacle naked. Achenes linear, truncate, 10-nerved. Pappus brownish, of minutely barbellulate bristles, the bristles about 30 to 45, persistent. (Resembling Apargia, a sort of dandelion.)

1. **A. boreàle** T. & G. Scapes slender, 1 or 2 from a tuft of basal leaves, 7 to 14 in. high; leaves entire or remotely denticulate, tapering to a broadish petiole, the whole 5 to 8 in. long; heads 5 to 11 lines broad; involucres 7

lines high; ligules exserted; achenes 2 to 2½ lines long; pappus 2½ to 3 lines long.—Wet meadows or "prairies," 3500 to 4000 ft., Bald Mt., Humboldt Co.; n. to Alas.

20. **TARÁXACUM** Haller. DANDELION

Perennial or biennial herbs, the leaves in a basal tuft and the heads solitary and terminal on naked hollow scapes. Leaves pinnatifid or toothed. Flowers yellow. Involucre double, the outer bracts much shorter and in several series, often reflexed or spreading, the inner bracts in a single row, erect. Receptacle naked. Achenes 4 or 5-ribbed, the ribs roughened or spinulose-muricate at apex, the body prolonged above into a very slender beak bearing at apex the copious soft white capillary pappus. (From Greek tarassein, to disturb or alter, in allusion to its supposed effects on the blood in medicine.)

Outer involucral bracts linear or lanceolate, reflexed or spreading.
  Achenes greenish or light brown, the beak 2 to 3 times as long.....1. *T. vulgare.*
  Achenes red, the beak 1½ to 2 times as long.....2. *T. laevigatum.*
Outer involucral bracts ovate, erect; achenes light brown, the beak about 2½ times as long .....3. *T. ceratophorum.*

1. **T. vulgáre** (Lam.) Schrank. COMMON DANDELION. Scapes several, erect or diffuse, 3 to 10 in. high; herbage glabrous or puberulent, a little succulent; leaves oblong or spatulate, sinuate-pinnatifid (and often with a large terminal lobe) to irregularly dentate, 2 to 11 in. long; inner bracts of the involucre linear or linear-lanceolate, acute, 5 to 7 lines long; outer ones similar, short, reflexed; flowers yellow; achenes 1½ lines long; beak 3½ to 4½ lines long; pappus brownish or white, 2½ to 3 lines long.—Low wet lands, nat. from Eur.: Eureka; Scott Valley, Siskiyou Co.; Meadow Valley, Plumas Co.; Cisco; Berkeley; Long Beach. (T. officinale Weber. T. dens-leonis Desf.)

2. **T. laevigàtum** (Willd.) DC. RED-SEEDED DANDELION. Similar to no. 1; scapes diffuse, 3 to 6 in. high; leaves deeply laciniate-pinnatifid or pinnately divided.—Old gardens and low places, introduced from Eur.: San Francisco Bay region. (T. erythrospermum Andrz.)

3. **T. ceratóphorum** (Ledeb.) DC. var. **bernardìnum** Jepson n. var. Scapes few, ascending or erect, often somewhat sinuous, 4 to 7 in. high; leaves spatulate to oblong-oblanceolate, subentire to saliently or irregularly dentate, narrowed below to a short petiole, 1¾ to 5 in. long; inner bracts of involucre lanceolate, the outer short ones ovate, erect or barely spreading; achenes 1 to 1½ lines long; beak 2½ to 3½ lines long; pappus 2 lines long.—Montane meadows, 7500 to 8200 ft., San Bernardino Mts. (South Fork Mdws., Santa Ana Cañon, Hall 7512, type).

21. **AGÒSERIS** Raf.

Perennial herbs with strong and often deep taproots, or annuals. Stems naked and scape-like, bearing single large heads. Leaves in a basal tuft, elongated. Flowers yellow. Bracts of the campanulate involucre imbricated, the outer often ovate, passing into the linear or lanceolate inner ones. Receptacle naked. Achenes terete, oblong or fusiform, 10-ribbed, prolonged into a slender or filiform beak. Pappus-bristles fine, copious, white or nearly white, inserted on the dilated apex of the beak. Achenes in fruit expanding and forming a globose head, the bracts of the involucre reflexed.—The achene of A. alpestris is not beaked. (Greek agos, chief, and seris, lettuce.)

Perennials (or biennials).
  Achenes narrowed at apex but not beaked; montane.....1. *A. alpestris.*
  Achenes beaked.
    Leaf-segments retrorse; achenes truncate or slightly cupped, very abruptly beaked; bracts of the involucre in 2 rather unlike sets...2. *A. retrorsa.*
    Leaves entire or toothed or parted, when lobed the segments not retrorse; achenes tapering above into the beak.
      Beak with nerves of body prolonged to apex.....3. *A. glauca.*
      Beak nerveless.
        Body of achene equaling or longer than beak.
          Leaves mostly deeply lobed; coastal.....4. *A. apargioides.*
          Leaves mostly entire; inner montane.....5. *A. elata.*
        Body of achene usually much shorter than beak.

Involucre usually equaling or exceeding the pappus; heads many-flowered.
Ligules commonly much exceeding the involucre.
Involucral bracts not very unlike, mostly oblong, glandular villous; fruiting heads 7 to 9 lines high.... 6. *A. hirsuta.*
Involucral bracts rather markedly differentiated, the inner long-linear or lanceolate-attenuate, the outer very short, ovate or oblong-lanceolate; fruiting heads 1⅛ to 1½ in. high....7. *A. grandiflora.*
Ligules shorter than the involucre or little exceeding it..... 8. *A. plebeia.*
Involucre little exceeding the beaks of the achenes; heads narrow, relatively few-flowered.....9. *A. gracilens.*
Annuals .....10. *A. heterophylla.*

1. **A. alpéstris** Greene. Scapes 1 to 3 from the crown of a stout taproot, 2 to 4 in. high; herbage pale, glaucous, glabrous, the stems sometimes a little tomentose; leaves lanceolate or oblanceolate, entire or remotely toothed or pinnatifid, ¾ to 3 in. long; involucres 5 to 9 lines high, their bracts linear or lanceolate; ligules well-exserted; achenes linear-fusiform, somewhat narrowed at summit but not beaked, 2½ to 4 lines long; pappus 3½ to 4 lines long.—Montane summits, 7500 to 10,100 ft.: White Mts.; Sierra Nevada from Mt. Whitney to Modoc and Siskiyou Cos.; n. to Wash. July-Aug. (A. monticola Greene.)

2. **A. retrórsa** Greene. Scapes 1 to several from a stout simple or branched root-crown, 6 to 18 in. high; herbage woolly-pubescent when young, the wool more or less deciduous in age; leaves lanceolate to oblong-lanceolate, pinnately parted into narrowly linear or lanceolate retrorse and more or less remote segments, 3 to 10 in. long; involucres 1 to 1¾ in. high, in maturity about equaling the pappus; bracts of the involucre in 2 rather unlike sets, the inner ones few, linear to linear-attenuate, very widely separated, subglabrous, the outer ones oblong to lanceolate, very much shorter, overlapping or slightly imbricated, persistently soft-ciliate, bearing a broad brown median band; ligules somewhat exceeding the involucre; achenes 2½ to 3 lines long, truncate or slightly cupped at the apex, the cup or truncation bearing abruptly a slender beak 7 to 10 lines long; pappus 5 to 8 lines long.—Montane often rocky slopes and flats, 2800 to 8000 ft.: mts. of coastal S. Cal.; San Emigdio Mts.; Tehachapi Range; Sierra Nevada from Kern Co. to Placer Co.; Coast Ranges from San Carlos Range and Mt. Sanhedrin to Siskiyou Co. June-July.

3. **A. gláuca** (Pursh) Greene var. **láciniàta** (Eat.) Smiley. Scapes slender, erect or at base decumbent, 1 to several from the short branches of the root-crown, 4 to 15 (or 18) in. high; herbage puberulent to glabrate; leaves exceedingly variable in outline, lanceolate or oblanceolate, entire or sparsely toothed, 5 to 12 in. long; involucres 6 to 7 lines high, their bracts oblong to lanceolate; achenes 2 to 3 lines long, tapering into a stout nervose beak 1 to 2½ lines long; pappus white, more or less barbellulate, 4 to 6 lines long.—Montane meadows, 4000 to 7500 ft.: Tulare Co. to Lassen Co., thence w. to Trinity and Siskiyou Cos.; n. to Ore., e. to Rocky Mts. June-Sept. (Troximon glaucum var. laciniatum Gray.) Var. DASYCÉPHALA Jepson n. comb. Scapes stout, 7 to 12 in. high; herbage glabrate or somewhat pubescent; leaves lanceolate, entire or toothed, 3½ to 5½ in. long; involucres 9 to 11 lines high, their inner bracts lanceolate, the outer ovate-lanceolate, shorter; achenes fusiform-linear, 3 to 3½ lines long, tapering into a thick nervose beak 1 line long; pappus yellowish white, 5 to 7 lines long.—Montane, 5000 to 10,000 ft.: White Mts.; Sierra Co. to Siskiyou Co.; e. to Col., n. to Wash. July. (Troximon glaucum var. dasycephalum T. & G.)

4. **A. apargioides** Greene. Scapes few to many from the root-crown, erect or ascending, 3 to 7 (or 12) in. high; herbage puberulent to glabrate; leaves oblanceolate, remotely toothed, pinnatifid into slender lobes, or sometimes entire, 2 to 5½ in. long; involucres 5 to 7 lines high, villous-pubescent, their bracts linear-attenuate; ligules well exserted; achenes fusiform, 1½ to 2 lines long, strongly ribbed, tapering into a nerveless beak, the beak shorter than or equaling the body of the achene; pappus white or yellowish white, 2 to 3

916. Agoseris hirsuta Greene; *a*, habit x ¼; *b*, leaf x ¼; *c*, achene with pappus x 1½; *d*, *e*, bracts x 1.

lines long. — Sandy hills and valleys along the coast, 5 to 500 ft.: Marin Co. to San Luis Obispo. Apr.-Aug.

5. **A. elàta** (Nutt.) Greene. Scapes stout, 1 to 2 ft. high; herbage glabrous to puberulent, the peduncles tomentulose beneath the heads; leaves erect, oblanceolate, entire or rarely remotely denticulate, narrowed below to a petiole, the whole 5 to 12 in. long; involucres ¾ to 1 in. high; bracts lanceolate or oblong-lanceolate, little unequal; achenes 4 to 4½ lines long, the beak about ½ to ⅔ as long; pappus 4 lines long.—High montane meadows, 6500 to 7000 ft.: Lake Tenaya; Fallen Leaf Lake; n. to Wash. (Troximon nuttallii Gray.)

6. **A. hirsùta** (Hook.) Greene. Fig. 916. Scapes several to many, erect, 5 to 17 in. high; herbage thinly hirsute or hirsutulose; leaves oblong-oblanceolate, entire to pinnatifid, narrowed below to a petiole, the whole 3 to 11 in. long; heads in fruit 7 to 9 lines high; involucres 6 to 7 lines high, their bracts in about 2 series but not very unequal, oblong to linear, obtuse or acute, villous-pubescent and often a little glandular; ligules much exserted, yellow, brownish on back; achenes strongly and acutely ribbed, 1¼ to 1½ lines long, the outer achenes sometimes with turgid or rounded ribs; beak 2½ lines long; pappus 2 to 2½ lines long.—Open fields and hillslopes, sandy or adobe ground, near the coast, 20 to 1000 ft.: Monterey Co. to Alameda Co. and w. Contra Costa Co.; n. to Wash. May-June. (Troximon humile Benth.)

7. **A. grandiflòra** (Nutt.) Greene. Scapes several from the branched crown of the taproot, stout, 1¼ to 2¼ ft. high; herbage hirsute-pubescent to glabrate, or the involucre and basal portions somewhat tomentose; leaves lanceolate or oblong-spatulate, entire or sinuate-dentate to laciniate or with salient subfalcate lobes, 4 to 12 in. long; fruiting heads mostly 1⅛ to 1½ in. high, the expanded fruiting heads 2 to 2¾ in. broad; involucre ⅞ to 1½ in. high, the inner bracts linear-lanceolate, the outer ones short, oblong to ovate or lanceolate, more or less reddish; achenes linear or somewhat turbinate, strongly ribbed, 2½ to 3 lines long, narrowing rather abruptly into a filiform beak 7 to 10 lines long; pappus 5 to 6 lines long.—Dry slopes or flats, 200 to 4800 ft.: throughout cismontane Cal.; n. to Wash. Var. LÁCINIÀTA Jepson n. comb. Scapes often slender, 6 to

917. Agoseris plebeia Greene; *a*, habit x ¼; *b*, leaf x ¼; *c*, achene with pappus x 1½; *d*, *e*, bracts x 1.

16 in. high; involucre 7 to 10 lines high, not over 1¾ in. broad at maturity; achenes 1½ to 2½ lines long, tapering into a filiform beak 3 to 5 lines long; pappus 3 to 4½ lines long.—North Coast Ranges; n. to B. C. (Stylopappus laciniatus Nutt.)

8. **A. plebèia** Greene. Fig. 917. Stems robust, few or several from the root-crown, erect, 1 to 2 ft. high; leaves 3 to 14 in. long, narrowly to broadly lanceolate, entire to pinnatifid with slender curving lobes, the apex commonly slenderly acuminate and entire; heads in anthesis only 5 to 7 lines broad, the ligules short, deep yellow, scarcely or not at all surpassing the bracts of the involucre; involucre commonly woolly at base; body of achene 2 to 2½ lines long, the beak 5 to 6 lines long; pappus white.—Open fields, foothill slopes, and montane valleys, 10 to 3500 or 6200 ft.: Humboldt Co. to coastal S. Cal.; Sierra Nevada.

9. **A. grácilens** (Gray) Ktze. Scapes few or several from the root-crown, rather stout, 8 to 17 in. high; herbage glabrate or the involucre and upper end of the peduncles glandular-puberulent; leaves oblong-lanceolate, subentire to remotely toothed or pinnatifid, 5 to 6 in. long; involucre 9 to 12 lines high; inner bracts lanceolate, the outer oblong, acute, half or less as long; achenes linear-fusiform, ribbed, 1¼ to 3 lines long, tapering into a slender beak 4 to 6 lines long; pappus white, 5 to 7 lines long.—Grassy flats or low ground along streams, 100 to 4100 ft.: Placer Co. to Plumas Co.; Humboldt Co. to Siskiyou Co.; n. to Wash. July-Aug. (Troximon gracilens Gray.) Var. GRÈENEI Jepson n. comb. Scapes more slender; herbage somewhat puberulent; involucre 7½ lines high, the bracts all lanceolate; achenes ribbed, 2 lines long, tapering into a beak 1 to 1½ lines long; pappus 3 to 3½ lines long.—Montane, 6000 to 7000 ft.: Nevada Co. to Siskiyou Co. (Troximon gracilens var. greenei Gray.)

10. **A. héterophýlla** (Nutt.) Greene. Scapes few to many, usually arising from a short basal leafy stem, 3 to 12 in. high; herbage villous-pubescent, the involucre and upper part of the peduncle often glandular or viscid; leaves linear to spatulate or oblong, entire, denticulate or sinuate-pinnatifid, 2 to 6 (or 8) in. long; ligules little or not at all exserted; involucre 4½ to 7 lines high; bracts lanceolate-acuminate; achenes 1 to 2 lines long, straight-ribbed, or the inner merely nervose, slightly pubescent to glabrous; beak filiform, 2 to 4 lines long, commonly longer than the whitish pappus.—Hillslopes and valley flats, 500 to 4000 ft.: throughout cismontane Cal.; n. to B. C. Var. KŸAMPLEÙRA Greene. Outer or sometimes all the achenes with the ribs corky and sinuate or undulate.—Alameda Co.; North Coast Ranges; Shasta Co.; Modoc Co. Var. CRŸPTOPLEÙRA Greene. Outer achenes enlarged or conspicuously inflated, somewhat striate, not ribbed.—Grassy hills, Humboldt Co. Var. CALIFÓRNICA Jepson n. comb. Heads in anthesis ¾ to 1½ in. broad, the ligules conspicuous, much exceeding the involucre; outer achenes with straight ribs.—Grassy hills and flats, widely distributed. (Cryptopleura californica Nutt.) Var. CRENULÀTA Jepson n. comb. Like var. californica but the ribs of the outer achenes corky, conspicuously undulate.—Widely distributed. (Troximon heterophyllum var. californicum f. crenulatum Hall.) Var. TÚRGIDA Jepson n. comb. Like var. californica but the achenes, or at least the outer ones, much inflated, not ribbed or at most inconspicuously striate.—Coastal S. Cal.; San Luis Obispo Co. (Troximon heterophyllum var. californicum f. turgidum Hall.)

22. **GLYPTOPLEÙRA** Eat.

Low annuals, the short stems and leaves in a compact tuft on the crown of the taproot. Leaves scarious-margined, surrounding the short-peduncled heads. Involucral bracts 7 to 12, equal, linear-lanceolate, somewhat connate below, some loose foliaceous ones at base. Receptacle naked. Achenes narrowly oblong, often incurved, obtusely 5-angled, each interval with a row of conspicuous pits, the pits separated by low transverse ridges, apex of the achene truncately constricted, becoming a very short and stout cupulate 5-nerved beak. Pappus-bristles bright white, the outer falling separately, the inner remaining united in a ring at base. (Greek glyptos, carved, and pleura, side, from the sculptured achenes.)

1. **G. marginàta** Eat. Plant much-branched and very leafy, forming a thick tuft 1 to 2 in. high and 1½ to 2½ in. broad; leaves obovate to spatulate, sinuately pinnatifid into rounded or oblong lobes with scarious toothed margin, 4 to 6 lines long, tapering into a broad petiole of often greater length; involucre 4 to 5 lines high, with thickish rounded base; inner bracts linear-attenuate, the outer with dilated green tip and white pectinate margins; ligules white, turning pink, scarcely exserted; achenes (including the short thick beak) 2 lines long; pappus 4 lines long.—Desert plains and washes, 2000 to 4000 ft.: central and eastern Mohave Desert; Inyo Co.; e. to Utah, n. to Ore. May. Var. SETULÒSA Jepson n. comb. Leaves oblong, sinuately pinnatifid into rounded or oblong lobes with the scarious margin acicular-toothed; outer bracts commonly bearing teeth only at their dilated tips; ligules broad, conspicuously exserted, white or yellow, often changing to pink, 4½ to 8 lines long.—Mohave Desert. (G. setulosa Gray.)

23. CALYCÒSERIS Gray

Branched annuals, the leaves mostly basal. Herbage glabrous, but the peduncles and involucres sprinkled with short tack-shaped glands. Heads rather large, long-peduncled, the ligules much exserted. Involucre many-flowered, the inner bracts numerous, narrow, scarious-margined, equal, the outer much shorter, loose, calyculate. Receptacle bearing capillary bristles. Achenes 5-ribbed, narrowed above to a short beak, the beak terminated by a shallow denticulate crown. Pappus copious, white, the bristles united at base and falling away in a ring. (Greek kalux, cup, alluding to the shallow cup at summit of achene, and seris, a cichoriaceous plant.)

Flowers yellow; achenes smooth or very minutely muriculate under a lens.....1. *C. parryi.*
Flowers white, turning purplish; achenes rugulose on the ribs.....2. *C. wrightii.*

1. **C. párryi** Gray. Stems 1 to several from base, branching, erect or ascending, leafy, ⅓ to 2 ft. high; tack-shaped glands dark-colored; leaves 1 to 5 in. long, pinnately divided into remote linear or filiform segments, the upper cauline ones smaller and bract-like; heads ¾ to 1¼ in. broad; involucres campanulate, 6 to 9 lines high, the inner bracts linear, attenuate at apex; achenes acutely 5-ribbed, the body 2 lines long, tapering into a shorter slender beak capped with a small white cup; pappus 3 lines long.—Arid mesas or valleys, 2000 to 5000 ft.: Inyo Co.; central and eastern Mohave Desert; Colorado Desert, thence w. to coastal San Diego Co.; e. to Ariz. and southern Nev. Apr.-May.

2. **C. wrightii** Gray. Similar to C. parryi; tack-shaped glands pale; ligules rose-color or white with pink-brown spots on back; achenes with rugulose ribs.—Sandy mesas or washes, 500 to 1500 ft.: Inyo Co.; e. Mohave Desert; Colorado Desert; e. to Utah and N. Mex. Apr.

24. HIERÀCIUM L. Hawkweed

Ours mostly rough-hairy erect perennial herbs. Leaves entire or nearly entire, never deeply lobed. Heads in a panicle or cymose cluster. Involucre cylindric or campanulate, its main bracts in 1 to 3 series, with shorter ones at base. Receptacle naked or sometimes more or less fimbrillate-toothed. Flowers yellow or white. Achenes linear, mostly 10-ribbed, not beaked. Pappus 1 or 2 rows of bristles, the bristles capillary, fragile, tawny, brownish or dull white. (Greek hierax, a hawk.)

Flowers white; stems ¾ to 3 ft. high; leaves mostly basal.....1. *H. albiflorum.*
Flowers yellow.
  Stems very leafy (at least below).
    Herbage tomentose with dense stellate pubescence.....2. *H. greenei.*
    Herbage (at least below) covered with long brown (or whitish) shaggy hairs.
      Leaves toothed; pappus sordid.....3. *H. argutum.*
      Leaves entire; pappus brownish.....4. *H. horridum.*
  Stems sparsely or not at all leafy.
    Basal leaves glabrous; involucre hirsute with black hairs.....5. *H. gracile.*
    Basal leaves more or less hairy.
      Leaves entire; involucre glandular.....6. *H. cynoglossoides.*
      Leaves more or less toothed; involucre not glandular.....7. *H. bolanderi.*

1. **H. albiflòrum** Hook. Fig. 918. Stems 1 to several from a thickish rootstock, slender, erect, nearly naked above, ¾ to 3 ft. high, ending in a loose

panicle of white-flowered heads; leaves and lower portion of stem thickly beset with tawny or whitish bristly hairs; leaves mostly basal, oblong to oblanceolate, 2 to 6 (or 12) in. long, narrowed at base to a winged petiole, or the upper cauline sessile and often lanceolate or linear, much smaller; involucres often glandular and with black hairs, 3 to 4 lines high, their bracts linear-subulate, the outer very short; achenes reddish brown, 1 to 1½ lines long; pappus dull white or tawny, fragile. —Dry openly wooded slopes in the hills and mts., 300 to 8500 ft.: throughout cismontane Cal.; e. to Col., n. to B. C. July-Aug.

918. Hieracium albiflorum Hook.; *a*, *b*, habit x, ¼; *c*, head x 1; *d*, achene and pappus x 1½.

2. **H. grèenei** Gray. Stems 1 or few from a tuft of basal or sub-basal leaves, simple or paniculately somewhat branched, ⅔ to 2 ft. high; herbage clothed with a dense grayish or rusty stellate tomentum, the lower leaves shaggy with long yellowish or grayish hairs; leaves chiefly basal and sub-basal, oblong-oblanceolate, entire or somewhat obscurely or remotely toothed, 1 to 3½ in. long; upper cauline leaves linear-oblong, much smaller; heads narrow, 5 to 8-flowered; flowers yellow; involucres of few linear obtuse bracts in several series, 4½ to 5 lines high; achenes linear, dark brown, 10-ribbed, 2¼ lines long; pappus reddish-brown.—Montane, dry pine slopes, 4100 to 5500 ft.: **Mt. Hull (n. Lake Co.) to Mt. Shasta; n. to southern Ore. July.**

3. **H. argùtum** Nutt. Stem simple, 1 to 2½ ft. high, terminating in a racemose panicle, the leaves in a basal tuft or nearly so; herbage bristly- or shaggy-pilose below, puberulent above, sometimes more or less glabrate, the involucre and peduncles glandular-puberulent; leaves oblanceolate to narrowly oblong, remotely and saliently toothed, 2 to 10 in. long, tapering to a narrow base or petiole, or the upper linear-lanceolate or linear and mostly entire, or the uppermost passing into bracts; involucres 4 to 5 lines high, with black stipitate glands, the inner bracts linear-attenuate, the outer shorter, passing into the bracts of the peduncle; flowers probably yellow; pappus sordid.—Santa Rosa and Santa Cruz Isls. Var. PARÍSHII Jepson n. comb. Stems leafy to middle, somewhat scattered.—Dry openly wooded cañon sides, about 2700 to 3000 ft.: San Gabriel and San Bernardino mountains. **July. (H. parishii Gray.)**

4. **H. hórridum** Fries. Stems few to many from stout horizontal roots, paniculately branched above, 4 to 13 in. high; herbage densely shaggy with rather soft long brown (or whitish) hairs, and also more or less puberulent; leaves spatulate to oblong, tapering to a narrow base, entire, 1 to 4 in. long; heads rather small; involucre 2 to 4 lines high; bracts lanceolate with the medial portion densely glandular, in about 2 series, the outer ones shorter; flowers bright yellow; achenes terete, 10-ribbed, 1½ lines long; pappus brownish, persistent.—Montane, often in rocky places, 5200 to 11,000 ft.: San Jacinto, San Bernardino and San Gabriel mountains; Sierra Nevada from Tulare Co. to Lassen and Modoc Cos.; Mt. Shasta. (H. breweri Gray.)

5. **H. grácile** Hook. var. **detónsum** Gray. Fig. 919. Stems 1 to several from a tuft of basal leaves, slender, puberulent, more or less branched above, sparsely leafy, 4 to 14 in. high; leaves spatulate to oblong oblanceolate, entire

919. Hieracium gracile var. detonsum Gray; *a, b,* habit x ½; *c,* fr. head x 1; *d,* achene and pappus x 2.

or nearly so, essentially glabrous, 1 to 3 in. long, tapering to a slender petiole ¼ to ⅔ as long; cauline leaves none or few and narrowly lanceolate to linear, 1 to 2¼ in. long; heads few or slender bracteate peduncles ½ to 2 in. long; involucres 3 to 4 lines high; peduncles and involucres glandular-pubescent, the involucres and often the peduncles sparsely hirsute with black hairs; achenes dark or reddish brown, 1 line long, rather prominently 10-ribbed; pappus dull white.—Montane flats or ridges, 8200 to 10,000 ft.: Sierra Nevada from Tulare Co. to Eldorado Co.; n. to B. C., e. to Col. July.

6. **H. cynoglóssoides** Arv. Stems 1 or few, simple, 1 to 2 ft. high, terminating in a broad cymose panicle; leaves chiefly basal and on lower part of stem, lanceolate to oblanceolate or oblong-oblanceolate, entire, tapering to a narrow base, hirsute with coarse shaggy brownish or yellowish hairs, 3 to 5 in. long; upper cauline leaves few, lanceolate, sessile, ½ to 2 in. long, passing into bracts above; peduncles densely stipitate-glandular, or sometimes obscurely so or only on upper part; involucres 5 to 6 lines high; inner bracts linear-attenuate, with scarious margin and densely glandular median portion; outer bracts shorter, passing into the bracts of the peduncle; flowers bright yellow, much exceeding the involucre; achenes dark brown, striate, 2½ lines long; pappus coarse, sordid.—Open woods of cañon sides, 3000 to 6000 ft.: Sierra Nevada from Tulare Co. to Modoc Co.; Yollo Bolly Mts.; e. Humboldt Co. to Siskiyou Co.; n. to B. C., e. to Rocky Mts. July-Aug. Var. NUDICÁULE Gray. Leaves basal, the stems naked or reduced to few remote bracts.—Humboldt Co. to Siskiyou and Shasta Cos.

7. **H. bolánderi** Gray. Stems 1 or few from base, loosely branched, glabrous or puberulent, 7 to 9 in. high, ending in a narrow few-flowered panicle; leaves basal, oblong, subentire or obscurely toothed, tapering below to a short winged petiole, more or less long-hirsute, 1½ to 2¾ in. long; receptacle somewhat fimbrillate-toothed; involucre narrow, 4 to 4½ lines high, glabrous or below minutely puberulent; main bracts 7 to 14, linear, mostly obtuse, in one series, the outer ones 2 or 3, calyculate; flowers yellow; achenes linear, dark brown, striate, 2 lines long; pappus dark-fuscous.—Mendocino Co. to Shasta Co.

25. CRÈPIS L.

Annuals, biennials or perennials, similar to Hieracium. Herbage tomentulous, hairy or glabrous. Leaves chiefly though not wholly basal, entire, toothed or deeply lobed. Heads in panicles or cymes. Involucre a single row of equal bracts, or often with smaller ones at base. Receptacle naked. Flowers yellow. Achenes columnar or fusiform 10 to 20-ribbed. Pappus copious, white or yellowish, soft. (Greek krepis, a sandal, the ancient name of some plant.)

A. Perennials; native species.

Low (1 to 2¾ in.), forming dense tufts; herbage glabrous; leaves entire.....1. *C. nana.*
Much taller, not tufted; herbage somewhat tomentose or hairy; leaves more or less toothed or pinnatifid.
Achenes with a short thick beak; herbage glabrous to shortly glandular-hispid.....
2. *C. andersonii.*

Achenes not beaked.
Herbage tomentose or glabrate, or sometimes with short glandular hairs.
One to 2 ft. high; stems greatly exceeding the basal leaves; leaves with a tail-like prolongation at apex (except in var. pleurocarpa); principal bracts of involucre usually 5 to 8, glabrous or sub-glabrous except in vars. ..... 3. *C. acuminata.*
Lower, the stems often not much exceeding the basal leaves; leaves seldom much prolonged, at apex; principal bracts of involucre usually 8 to 12, gray-pubescent ..... 4. *C. occidentalis.*
Herbage bristly with long hairs, also more or less tomentose.
Bristly hairs not glandular ..... 5. *C. subacaulis.*
Bristly hairs glandular ..... 6. *C. monticola.*

B. Annuals or biennials; introduced species.

Herbage glabrous to glandular-pubescent; achenes 1 line long, narrowed equally at each end ..... 7. *C. capillaris.*
Herbage glabrous to hispidulose; achenes attenuate upward into a beak, 3½ to 4 lines long ..... 8. *C. vesicaria.*

1. **C. nàna** Rich. Densely tufted, 1 to 2¾ in. high; stems many from the short branches of the root-crown, bearing a small cyme of 2 to 6 heads or a solitary head; herbage glabrous; leaves mostly basal, obovate-spatulate, thickish, entire or essentially so, 1 to 2 in. long, tapering to a margined petiole ½ to as long; heads narrowly cylindric, little surpassing the leaves; involucre 3½ to 5 lines high, the inner bracts linear, obtuse, scarious-margined, the outer ones oblong, very short; ligules yellowish, exserted; achenes linear, constricted below the disk at the apex, 10 to 13-nerved, 2 to 3 lines long; pappus 2 lines long, readily deciduous.—High montane slopes, 8000 to 10,600 ft., rare: Mt. San Antonio; Farewell Gap; Sonora Pass; e. to Nev. and Col., n. to Can. July.

2. **C. andersònii** Gray. Stems 1 to several from the very heavy root-crown, erect or ascending, 16 to 18 in. high, cymosely forked and bearing only 2 to 4 heads, the leaves basal or the cauline few and bract-like; herbage nearly glabrous to sparsely hispid with short often glandular hairs; leaves oblong-obovate, laciniately pinnatifid or dentate, drawn down to a winged base, 1¾ to 6 in. long; involucres 5 to 8 lines high, glandular-pubescent; bracts somewhat imbricated, the inner rather broadly lanceolate, the outermost oblong- to ovate-lanceolate, ½ to ¾ as long as the inner; achenes fusiform, unequally 8 to 10-ribbed, tapering to a short thick beak; pappus 3 to 4 lines long.—Alkaline or wet meadows, 4500 to 5500 ft.: e. Sierra Co.; w. Nev. to e. Ore. June-July.

3. **C. acùminàta** Nutt. Stems slender, 1 to several from a cluster of basal leaves, cymosely branched above, 1 to 2 ft. high; herbage cinereous-puberulent, the inflorescence glabrous or nearly so; basal and lower cauline leaves lanceolate to ovate-lanceolate, pinnatifid with narrow spreading or retrorse, often somewhat toothed lobes, attenuate below into a petiole and above into a tail-like prolongation, the whole 4 to 12 in. long; upper cauline leaves linear, entire, sessile; involucres narrow, 4 to 5 lines high, glabrous, the inner bracts linear, usually with a thickened median callus below, the outer ones small; ligules light yellow, well exserted; achenes linear-fusiform or tapering upward, 10-nerved, 3 lines long; pappus persistent, yellowish-white, the bristles somewhat united in a ring at base, 3 lines long.—Dry ground, 4200 to 9600 ft.: San Bernardino and San Gabriel mountains; Frazier Mt.; Sierra Nevada from Kern Co. to Lassen Co.; Yollo Bolly Mts.; e. to Col., n. to Ore. and Mont. June-July. Var. INTERMÈDIA Jepson n. comb. Herbage, including the involucre, tomentose or tomentulose; involucres 5 to 7½ lines high; achenes attenuate upward, 3 to 4 lines long, equaling or longer than the pappus.—Montane, 1500 to 10,300 ft.: n. Lake Co. to Humboldt Co.; Sierra Nevada; desert ranges in Inyo Co.; e. to Col. (C. intermedia Gray.) Var. PLEUROCÁRPA Jepson n. comb. Leaves commonly not prolonged at apex; achenes less obviously narrowed upward, shorter than the pappus, saliently 10-ribbed.—Montane, 1500 to 7500 ft.: n. Lake Co. to Siskiyou Co., thence e. to Modoc and Lassen Cos. (C. intermedia var. pleurocarpa Gray.)

4. **C. occidentális** Nutt. GRAY HAWKSBEARD. Stems stout, one or several from the very scaly summit of the root-crown, branching above, 4 to 12 in. high; herbage pubescent, thinly tomentulose or glabrate, and often with

short gland-tipped hairs, especially on the peduncles; leaves oblong or ovate to lanceolate, runcinately toothed or deeply pinnatifid into linear or lanceolate lobes, entire at the acuminate apex, 3 to 7 in. long, on petioles about ½ as long; involucres 6 to 8 lines high, the inner bracts linear-attenuate, the outer ovate to lanceolate, small; achenes brown, oblong, narrowed towards the apex, 10 to 18-costate, 3 to 3½ (or 4) lines long; pappus 4 to 5 lines long.—Stony or sandy mountain ridges, 4000 to 8800 ft.: San Bernardino Mts.; mts. of n. Ventura Co.; Tehachapi Mts.; desert ranges of Inyo Co.; Sierra Nevada from Tulare Co. to Nevada and Modoc Cos.; Mt. Hamilton; Siskiyou Co.; n. to eastern Ore. and Wash., e. to western Nev.

5. **C. subacáulis** Cov. Stems leafy, 1 to several from the base, 3 to 10 in. high, bearing several stout-pedunculate heads; herbage more or less tomentose, hirsute with long glandless spreading hairs, those of the involucre few, black; leaves oblong to ovate in outline, 2 to 5 in. long, pinnately parted into oblong lobes, the lobes again pinnately parted, toothed or cleft; involucres 6 to 8 lines high, the inner bracts linear-attenuate, the few short outer ones lanceolate; achenes dark or black, linear, attenuate upward, about 10-nerved, 4½ lines long.—Montane valleys, 3500 to 6000 ft., Sierra Co. to Siskiyou Co.

6. **C. montícola** Cov. Stems 1 to several from the base, leafy, cymosely branched above, 5 to 14 in. high; herbage darkish, glandular-hirsute, sometimes scantily tomentose as well; basal leaves oblong to ovate-lanceolate, dentate to pinnatifid with toothed lobes, 2 to 6 in. long, the petioles margined, 1 to 2 in. long; cauline leaves similar, sessile, 1½ to 3½ in. long; involucres 8 to 10 (or 11) lines high, the bracts lanceolate, with or without shorter ones at base; achenes oblong, slightly narrowed near apex, with 10 prominent ribs and often smaller intermediate ones, 3 lines long; pappus 3½ to 4 lines long, tardily deciduous, leaving a white crown.—Montane at middle altitudes (4000 to 6000 ft.): Lake Co. to Siskiyou Co., thence e. to Lassen Co.; n. to Ore. May-June.

7. **C. capillàris** (L.) Wallr. Smooth Hawksbeard. Annual or biennial; stems 1 to several from base, slender, simple below, paniculate above, 1 to 2½ ft. high; herbage green and glabrous to glandular-pubescent; leaves mostly basal, broadly oblanceolate, thinnish, toothed (the teeth inclined to be salient), or pinnatifid or pinnately parted, 2 to 4 in. long, narrowed into a winged petiole; upper cauline lanceolate, with broad sessile base, 1 to 2 in. long; heads many, small; involucres 2 to 3½ lines high, the bracts linear, acuminate; achenes linear-oblong or narrowed equally at each end, 10-ribbed, 1 line long; pappus 1½ to 2 lines long. — Introduced European weed, spontaneous in fields and pastures: Eureka; Berkeley; Hetch-Hetchy. (C. virens L.)

8. **C. vesicària** L. var. **taráxacifòlia** Thuill. Rough Hawksbeard. Biennial; stems 1 or few from the root-crown, paniculately branched above, 1½ to 2½ ft. high; herbage subglabrous, but provided with short scattered bristles, these gland-tipped on the peduncles and involucres; basal and lower leaves oblong or spatulate in outline, pinnately parted, runcinate-pinnatifid or sometimes merely dentate, 1½ to 4 in. long, on petioles about ½ as long; upper cauline leaves small and scattered, sessile by a sagittate-dentate base; involucre 4 to 6 lines high; achenes oblong, 10 to 13-ribbed, the body 2 to 2½ lines long, narrowed above to a rather slender beak 1½ lines long, the narrowed portion not filled by the seed; pappus 2½ lines long. -Introduced from Eur.: spontaneous on the Mendocino coast and near Los Angeles, June-Aug. (C. biennis auct. Cal.)

26. **LYGODÉSMIA** Don

Much-branched herbs with slender tough branches. Leaves narrow or those of the branchlets scale-like. Heads terminal on the branchlets, 3 to 12-flowered. Receptacle naked. Flowers pink or rose-color. Achenes slender, terete but tapering slightly to base, angled or obscurely striate, truncate at each end, glabrous. Pappus persistent, of numerous bristles, the bristles capillary, unequal, white or whitish, not plumose. (Greek lugos, a pliant twig, and desme, bundle, the original species with fasciculate stems.)

Very spinescent perennial; pappus yellowish white ..... 1. *L. spinosa.*
Annual; not spinescent; pappus bright white ..... 2. *L. exigua.*

1. **L. spinòsa** Nutt. Stems few or several from the root-crown, many times parted into slender rigid branches with spinose-tipped branchlets, forming an almost leafless and very thorny plant ⅓ to 2 ft. high; root-crown indurated, matted with large tufts of wool; herbage bright green, puberulent to glabrate; lower leaves linear, entire, 3 lines to 2 in. long, the upper reduced to scales; heads about 3-flowered, mostly erect, subsessile or on very short branchlets; involucres 4½ lines high, their bracts loose, the inner lanceolate, the outer broad, calyculate; ligules well exserted, rose-pink; achenes slightly tapering from apex to base, somewhat 5-angled, 2 lines long; pappus 3 lines long.—Gravelly slopes or alkaline plains, 4000 to 6000 ft.: e. of Sierra Nevada from Modoc Co. to Inyo Co.; Blue Ridge, San Gabriel Mts. (F. W. Peirson); e. to Nev. and Utah.

2. **L. exígua** Gray. Diffusely much-branched annual 4 to 12 in. high; herbage glabrous or puberulent; leaves mostly basal, spatulate, entire or runcinately toothed or pinnatifid, ¾ to 1¼ in. long, the upper few and smaller, those of the branchlets reduced to scales; heads small, about 3 or 4-flowered, terminating slender branchlets about ½ to 1 in. long; involucres 2 to 2½ lines high, the inner bracts lanceolate, the outer few, minute, calyculate; achenes clay-white, 5-angled, minutely roughened, 1¼ to 2 lines long, the sides with a median groove; pappus 1¼ lines long.—Desert cañons or valleys, 200 to 4000 ft.: Colorado Desert; n. to Inyo Co.; e. to Utah and N. Mex. May.

Tribe 2. **Mutísieae.** Mutisia Tribe

Herbs or shrubs. Leaves alternate. Heads with the flowers all alike. Corolla in ours 2-lipped with 2 lobes in upper lip and 3 in lower, the lower lip in marginal flowers often elongated. Anthers with long tails at base. Style-branches of perfect flowers not appendaged, in ours comparatively long.

27. **TRÍXIS** P. Br.

Ours a low desert shrub. Leaves alternate, entire or merely denticulate. Heads (in ours) terminal on the leafy corymbose branchlets. Flowers yellow, all perfect and fertile. Corolla 2-lipped; upper lip deeply 2-lobed; lower lip ligulate, 3-toothed at apex, larger in marginal flowers. Involucre subtended by several leafy bracts, its proper bracts chartaceous or coriaceous, 8 to 12 in one rank (in ours). Achenes slender, sometimes tapering to or somewhat beaked at the summit. Pappus soft. (Greek trixos, three-fold, referring to the 3-cleft corolla lip.)

1. **T. californica** Kell. Stems many from the base, erect, 1¼ to 2 or 4 ft. high, leafy up to the heads; herbage glabrous or scaberulous; leaves ovate-lanceolate, sessile, 1½ to 2 in. long; involucral bracts dull straw-color, linear, acute, 5 to 6 lines long; achenes densely squamellate.—Desert washes: w. and n. borders of the Colorado Desert; e. to Ariz., s. to L. Cal. (T. suffruticosa Wats.)

28. **PERÈZIA** Lag.

Branching perennial herbs. Leaves alternate, coriaceous, reticulated. Heads (in ours) cymosely paniculate. Involucre narrowly campanulate, its

920. Perezia microcephala Gray; *a*, lower leaf x ¼; *b*, infl. x ½; *c*, fl. x 3.

bracts narrow, imbricated. Corolla 2-lipped, whitish or purplish. Achenes 5-angled, the angles nerved. Pappus (in ours) of many capillary scabrous bristles. (Lorenzo Perez, Spanish medical botanist, 16th century.)

1. **P. microcéphala** (DC.) Gray. SACAPELLOTE. Fig. 920. Stem stout, leafy, 2½ to 3½ ft. high; herbage glandular-puberulent; leaves oblong-ovate, denticulate, cordate-clasping, 2 to 7½ in. long; panicle 5 to 11 in. broad; heads 4 to 5½ lines high; bracts of the involucre linear, acute, mucronate; corolla rose-color to white, the lower (or outer) lip broad, 3-toothed, the upper lip deeply parted into 2 linear lobes; pappus white, soft.—Chaparral belt, rather common: San Luis Obispo Co. to w. San Diego Co.; Santa Rosa Isl.

TRIBE 3. Eupatorieae. EUPATORY TRIBE

Ours herbs or suffrutescent plants with white or flesh-colored perfect disk-flowers and no rays. Receptacle naked. Anthers not caudate at base. Style-branches stigmatic only below the middle.

29. TRICHOCORÒNIS Gray

Slender herb, the stems branching, weak or at base creeping. Leaves opposite, sessile. Flowers flesh-color, in slender peduncled heads terminating the branches. Receptacle convex, naked. Bracts of the involucre 12 to 18, herbaceous or somewhat membranous, equal, nerveless. Corolla abruptly much dilated above the narrow tube. Pappus of many small or minute paleae and awns, forming a sort of crown. (Greek trichos, hair, and koronis, top.)

1. **T. wrìghtii** Gray. Annual; stems assurgent, 6 to 9 in. high, rooting at the lower nodes; leaves oblong or linear-lanceolate, remotely serrate or entire, auricled at base, 4 to 13 lines long; heads 2 to 2½ lines broad; achenes 5-angled, the angles hispidulous toward the summit; pappus of 4 barbellate bristles with an equal number of intervening but very small fimbriate paleae.—Muddy shores or moist bottoms: Sutter Co.; lower San Joaquin River; Beaumont; San Jacinto Lake; thence e. to southern Tex., s. to Mex. Sept. (T. riparia Greene. Biolettia riparia Greene.)

921. Malperia tenuis Wats.; *a*, fl. branchlet x ½; *b*, outer bract x 4; *c*, inner bract x 4; *d*, fl. x 4; *e*, pappus-bristle x 8.

30. MALPÈRIA Wats.

Annual plants with the aspect of Rigiopappus. Leaves alternate, narrow, sessile. Heads loosely cymose. Involucre turbinate, its bracts very unequal, thin, scarious-margined, 2 or 3-nerved. Receptacle flat, naked. Style-branches thickened, included, exserted in age. Achenes slender, 5-angled. Pappus-paleae 3 or 4, minute, truncate and erose, with 3 intervening barbellulate bristles as long as the corolla and dilated at base. (Etymology obscure.)

1. **M. ténuis** Wats. Fig. 921. Stems erect, branching, 8 to 12 in. high, glabrous; leaves narrowly linear, entire, obscurely puberulent, 1 to 2 in. long; heads 4 to 5 lines high, its bracts narrowly lanceolate, pubescent on the back; flowers brownish.—Sw. Colorado Desert: Split Mt.; Signal Mt.; s. to L. Cal.

31. BRICKÉLLIA Ell.

Perennial herbs or low shrubs. Leaves alternate, sometimes opposite, resinous-dotted. Flowers white or whitish, in narrow heads. Heads in termi-

nal clusters or paniculate or solitary. Involucre imbricated, its bracts usually striately nerved. Receptacle naked. Corolla slender, 5-toothed. Achene with 10 nerves or ribs. Pappus of numerous scabrous or barbellate capillary bristles mostly in a single series. (Dr. John Brickell, early Georgia botanist.) COLEOSANTHUS.

A. Heads solitary or terminating the more or less corymbosely arranged branchlets.

Stems leafy up to the heads.....1. *B. greenei.*
Stems not leafy up to the heads (except outer bracts of the involucre leaf-like in var. of no. 3).
Herbage whitened with a dense rather close tomentum; involucral bracts in 5 or 6 series, well imbricated.....2. *B. incana.*
Herbage green; involucral bracts in 3 or 4 series, not so closely imbricated.
Outer bracts of involucre foliaceous; leaves ovate, mostly saliently toothed.....3. *B. atractyloides.*
Outer bracts of involucre not foliaceous; leaves mostly narrower, entire or nearly so.
Branches divaricate; pappus 2½ to 3½ lines long, usually surpassing the involucral bracts; leaves of the branchlets not over 4 lines long...4. *B. frutescens.*
Branches ascending; pappus 4 lines long, usually equaled or surpassed by the involucral bracts; leaves of the branchlets 6 to 11 lines long...5. *B. oblongifolia.*

B. Heads clustered, usually somewhat racemose-paniculate, or if terminating the branchlets these not corymbosely arranged.

Leaves lanceolate, entire, trough-shaped; heads in racemosely arranged clusters; involucre 2 to 2½ lines high.....6. *B. multiflora.*
Leaves ovate to ovate-lanceolate, toothed, plane or nearly so.
Leaves of the branchlets with blades mostly 3 to 5 lines long.
Outer involucral bracts herbaceous-tipped.
Leaves and young stems tomentose.....7. *B. nevinii.*
Leaves and stems glandular-villous and viscid.....8. *B. microphylla.*
Outer involucral bracts not herbaceous-tipped.
Leaves and young stems viscid and puberulent.....9. *B. watsonii.*
Leaves and young stems white-puberulent, not viscid....10. *B. desertorum.*
Leaves of the branchlets with blades mostly 4 to 12 (or 24) lines long.
Heads in clusters racemosely arranged along the main stem or branches.....11. *B. californica.*
Heads not in racemosely arranged clusters.
Outer involucral bracts abruptly tipped with a long spreading tail.....12. *B. grandiflora.*
Outer involucral bracts not long-tailed.....13. *B. knappiana.*

1. **B. grēenei** Gray. Stems many from a woody base, erect or ascending, simple or somewhat branched above, very leafy, 9 to 16 in. high; herbage very viscid and glaudular-pilose up to the heads; leaves alternate, ovate, mostly serrate, sometimes entire, 7 to 11 lines long, the petioles about ½ line long; heads terminal and solitary or terminating the corymbosely arranged branchlets, closely subtended and the lower portion enveloped by a tuft of leaves; involucres 6 to 7 lines high, their bracts linear, acuminate, 2 or 4-nerved, nearly or quite equaling the pappus.—Montane, 6000 to 8000 ft.: Placer Co. to Lassen Peak; Yollo Bolly Mts.; Scott Mts.; Mt. Shasta; n. to Ore. June-Aug.

2. **B. incàna** Gray. Stems suffrutescent below, branching, forming a globose bush 2 to 4 ft. high; herbage white with close tomentum, the tomentum deciduous from the stems and revealing the chalky-white bark beneath; leaves alternate, broadly ovate, entire or serrulate, 5 to 12 lines long, sessile or on petioles ½ line long; heads solitary, terminating the branchlets, large for the genus (9 to 12 lines high in fruit); involucres turbinate-campanulate, 7 to 9 lines high, their bracts well imbricated in 5 or 6 series; pappus at maturity much exceeding the bracts; achenes ashy-pubescent, the base with a conspicuous callus.—Sandy washes and mesas in the deserts, 1500 to 3000 ft.: n. Colorado Desert; Mohave Desert; e. to southern Nev. May-June.

3. **B. atractyloides** Gray var. **argùta** Jepson n. comb. Low much-branched shrub (8 to 14 in. high); herbage with scattered gland-tipped hairs, the old stems dark, the young stems whitish, the leaves vivid green; leaves alternate, ovate, saliently toothed or serrate to entire, the acute or commonly acuminate apex mostly entire, prominently veined, 6 to 11 lines long, the petioles very short (½ line long); heads solitary at the ends of the branchlets on slender peduncles ½ to 1½ in. long; involucre 5 to 6 lines high, the outer

bracts lanceolate or ovate, rarely foliaceous, the inner linear-attenuate; pappus sordid, at maturity surpassing the involucral bracts.—Desert valleys and mesas, 2000 to 4000 ft.: Inyo Co.; Mohave Desert; Colorado Desert; s. to L. Cal. Apr.-June. (B. arguta Rob.) It passes in e. Inyo Co. into B. atractyloides of s. Nev. which is granular-puberulent, not glandular, and with broader involucral bracts. Var. ODONTÓLEPIS Jepson n. comb. Involucre subtended by foliaceous dentate bracts.—W. Colorado Desert. (B. arguta var. odontolepis Rob.)

4. **B. frutéscens** Gray. Rigid shrub 8 to 14 in. high, the branches divaricate and often spinose; herbage glandular-pubescent; leaves alternate, linear-spatulate, obtuse, entire, 2 to 5 lines long; heads terminal on the corymbose branchlets, 26 to 35-flowered; involucres campanulate, 4 to 5 lines high; bracts distinctly 2 to 4-nerved, acute or obtuse, the short and oblong outer ones somewhat greenish-tipped; achenes hispidulous-scabrous; pappus-bristles minutely serrulate.—W. borders of the Colorado Desert; s. to L. Cal. Apr.-May.

5. **B. oblongifòlia** Nutt. var. **linifòlia** Rob. Stems numerous from a woody base, ascending or erect, leafy, forming round-topped clumps 7 to 12 in. high; herbage cinereous-pubescent and also glandular, at least above; leaves broadly oblong or oblong-ovate to linear, acute, entire or with 1 or 2 short teeth, 7 to 10 (16) lines long, sessile or with petioles 1 line long; heads 6 to 8 lines high, 30 to 50-flowered, terminal on partly naked peduncles; involucres campanulate, 5½ to 6½ lines high; bracts 2 to 4-nerved, linear, acute to attenuate, the inner with very slender tips; achenes hispidulous on the ribs.—Desert areas, 4000 to 6000 ft.: Colorado and Mohave deserts; Inyo Co.; e. to Utah and Ariz. (B. mohavensis Gray.)

6. **B. multiflòra** Kell. Erect shrub 3 to 8 ft. high, the stem and branches white; herbage glabrous, sometimes slightly scabrid; leaves alternate, ovate-lanceolate to lanceolate, entire or denticulate, 3-nerved, commonly sickle-shaped, markedly trough-shaped (that is, the sides a little conduplicate), very gummy, 1 to 3 in. long, the petioles ½ to 2 lines long; leaves of the crowded panicle lanceolate to linear, small, with obscure lateral nerves; heads racemose-paniculate or the panicle compound and as much as ½ to 1¼ ft. long; bracts of the involucre 13 to 31; receptacle glabrous; achenes sparsely hairy, ¾ line long. Sandy washes, east side Sierra Nevada, 4000 to 6000 ft.: Hanaupah Cañon, Panamint Range; Silver Cañon, Inyo Range; e. to Soda Sprs. Cañon, Esmeralda Co., Nev., n. to Kings Cañon, Ormsby Co., Nev.

922. Brickellia nevinii Gray; *a*, infl. x ½; *b*, fl. x 2.

7. **B. nevínii** Gray. Fig. 922. Dense shrub, the stems several from the base, 1 to 1½ ft. high, slender, crowded with short branches above, the heads solitary or in 2 or 3-flowered glomerules on the ends of the branches and thus paniculate; herbage white-tomentose, the tomentum soon becoming loose, especially on the stems; leaves alternate, ovate, subcordate and closely sessile or on very short (½ line) petioles or rarely cuneate at base, acutish, few-toothed or entire, 3 to 8 lines long; heads oblong-cylindric, 21 to 25-flowered; involucres narrowly turbinate, white-tomentose (or in age glabrate and green), 4½ to 5½ lines high, their bracts linear, acute, the outer regularly shorter, the outermost

commonly with spreading tips, the inner with erect acuminate tips; achenes minutely pubescent.—Foothills: Santa Monica Mts.; San Gabriel Mts.

8. **B. microphýlla** Gray. Stems erect from a somewhat woody base, 1 to 2 ft. high, paniculately much branched, the short leafy branchlets terminated by 1 to 3 heads; herbage glandular, short-villous or -puberulent, rarely a little tomentulose; leaves roundish ovate to oblong, subcordate or truncatish at base, obtuse or apiculate, vivid green, when old somewhat scabrous, denticulate or subentire, 4 to 9 lines long, sessile or on petioles to 2 lines long, those of flowering branchlets 1 to 2 lines long; heads 5 to 5½ lines long, about 22-flowered; bracts of the involucre about 21 to 45, herbaceous at the apex; flowers yellowish or a little purplish; achenes grayish brown, 2 lines long, hispidulous on the ribs; pappus-bristles obscurely barbellate.—Sandy cañons, 5000 to 6000 ft.: San Gabriel Mts.; e. side Sierra Nevada from Inyo and Mono Cos., Cal., to Storey Co., Nev.; e. to Col., n. to Ore. and Ida. Sept.-Oct.

9. **B. watsònii** Rob. Habit and foliage as in no. 8; stems and peduncles tomentulose-puberulent, the leaves puberulent and a little glandular; leaves ovate, sparingly dentate or denticulate, 4 to 8 lines long, the petioles about 1 line long; leaves of the flowering branchlets 1 to 3 lines long, subsessile; heads 1 to 3 on the ends of the branchlets, 3 to 4 lines high, 13 to 18-flowered; bracts of the involucre linear, acute, the shorter outer ones with recurved green tips; achenes 1½ lines long.—Providence Mts., e. Mohave Desert; e. to Nev. and Utah. Aug.

10. **B. desertòrum** Cov. Shrubby, branching, 3 ft. high, the branches slender; herbage white-tomentulose, the branches becoming glabrate and white-barked; leaves opposite or alternate, ovate, crenate-serrate, obtuse, 2 to 4 lines long, white-tomentulose; petioles about ½ line long; heads in glomerules terminating the short lateral branchlets, 8 to 12-flowered; involucres 3 to 4 lines high, the bracts linear, acute, striate, not herbaceous-tipped; flowers white; achenes finely setulose on the ribs.—Desert cañons, rare: Inyo Co.; Colorado Desert; e. to Ariz. and Nev. Oct.-Nov.

11. **B. califórnica** T. & G. Stems many from the shrubby base, virgate or paniculately branching, 2 to 3 ft. high; herbage roughish puberulent; leaves roundish or triangular-ovate, 3-ribbed and roughish, somewhat irregularly serrate, ½ to 2¼ in. long; glomerules of heads spicate or racemose along the more or less leafy stems; heads 5 to 6 lines high, 10 to 15-flowered, often more or less nodding; bracts of the involucre, especially the inner, with thin obtuse straight tips; achenes 1¼ lines long, the pappus-bristles white or more or less sordid, slightly scabrid.—Gravelly stream beds, 200 to 2700 ft.: Coast Ranges from Siskiyou Co. to San Luis Obispo Co.; Sierra Nevada foothills from Shasta Co. to Amador Co.; coastal S. Cal.; e. to Col. and New Mex., s. to Mex. The plants fill arid valleys at night with their perfume. Var. JEPSÒNII Rob. Leaves and pubescence as in the species; heads on pedicels ⅓ to 2 in. long; outer involucral bracts acutish, the inner acute.—Solano Co. to Lake Co. July-Sept.

12. **B. grandiflòra** Nutt. Stems herbaceous, erect, several from a fusiform root, usually simple up to the inflorescence, 1 to 2¼ ft. high; herbage finely puberulent or somewhat cinereous; leaves usually opposite or sometimes alternate, deltoid-ovate or lanceolate, truncatish or cordate at base, 1¼ to 2¾ in. long, dentate, the acuminate apex entire; cyme one and compact, terminating the stem, or several and terminal on the branchlets and thus more or less paniculate; heads more or less drooping, 20 to 38-flowered; involucres 6 to 7 lines high, the bracts about 30 to 37, green, 5 to 7-nerved, loosely imbricated, the inner linear, acute, the outer oblong to ovate, caudate or subulate-attenuate at apex, the subulate part of the bracts loose, commonly longer than the body; flowers greenish or yellowish white, the golden yellow style-branches conspicuously exserted; achenes 2 lines long, brown, slightly hirtellous; pappus-bristles white, barbellate, caducous.—Montane, 4000 to 6500 ft.: Sierra Nevada from Mariposa Co. to Shasta Co.; Siskiyou Co.; n. to Wash., e. to Ariz. and Col. Var. PETIOLÀRIS Gray. Slender, the axils often with leafy shoots; leaves subcordate at base, caudate-acuminate, mi-

nutely scabrid-puberulent, the petiole about as long as the blade.—Sonora Pass; e. to Col. and N. Mex., s. to Ariz. and Mex.

13. **B. knappiàna** Drew. Slender willow-like shrub 2 to 8 ft. high, the branches white-barked or the bark in age shreddy; stems evidently, the leaves very slightly scaberulose and somewhat glutinous; leaves alternate, ovate to lanceolate, acute, serrate or sometimes saliently toothed, 1 to 1¼ in. long, the petioles 2 lines long; heads in glomerules terminating lateral branchlets of the leafy panicle, 5-flowered; involucres turbinate, 2 to 3 lines high; bracts linear to oblong, obtuse, regularly imbricated, the outer successively shorter, 4-nerved; achenes rather densely but minutely appressed-setulose, indistinctly nerved.—Rare, Panamint Mts., Inyo Co., 3000 ft. Aug.-Sept.

32. **HOFMEISTÈRIA** Walp.

Bushy plants. Lower leaves opposite, the upper alternate. Heads medium-sized, long-peduncled or nearly sessile, many-flowered. Flowers whitish. Involucre campanulate, its bracts narrow, striate, imbricated. Receptacle naked. Achenes 5-angled by the strong nerves, callous-thickened at base. Pappus of 2 to 19 scabrous bristles, some of them paleaceous at base. (W. Hofmeister, the great plant embryologist.)

923. Hofmeisteria pluriseta Gray; *a*, fl. branchlet x ⅓; *b*, involucral bract x 2½; *c*, fl. x 2½.

1. **H. plurisèta** Gray. Fig. 923. Intricately branched bush, 1 to 2⅔ ft. high; herbage glandular-puberulent; leaves deltoid, acuminate, entire or with a few acute or subulate teeth, 2 to 4 lines long, on petioles ¾ to 1¾ in. long; involucre 4 lines high, about 23 to 26-flowered; bracts conspicuously 3-striate, with acuminate often recurved tip; pappus-bristles 10 to 19, unequal, the longer about equaling the corolla, some of them scarious-margined at base, or the scarious margins becoming free.—Rocky beds and walls of cañons in the deserts: Inyo Co. to the Mohave and Colorado deserts; e. to Ariz.

33. **EUPATÒRIUM** L. THOROUGHWORT

Ours erect perennial herbs with the leaves mostly opposite. Heads discoid, in terminal corymbs. Flowers purplish or white, perfect. Receptacle naked. Styles with long thickened or clavate branches, much exserted. Achenes angular or striated. Pappus consisting of a single row of capillary bristles. (Eupator Mithridates, King of Pontus; Pliny says the king used a species as a poison antidote.)

1. **E. occidentàle** Hook. Stems several from the base, strict, simple or with few ascending branches, 1 to 1½ ft. high; herbage minutely puberulent, glabrate; leaves ovate, truncate or subcordate at base, or sometimes roundish, coarsely serrate to subentire, 1 to 1½ in. long, the petioles 1 to 7 lines long; cymes small, compact, somewhat paniculate; heads 4 to 5 lines high, 8 to 16-flowered; involucres very slightly longer than the mature achenes, the bracts 9 to 15 in 2 series, nearly equal, lanceolate, rather firm, nearly nerveless; corolla pinkish, sometimes whitish.—Montane: Sierra Nevada, 4000 to 9500 ft., from Tulare Co. to Nevada Co.; Mt. Shasta; Humboldt Co., 2000 to 4000 ft.; n. to Wash., e. to Nev. Var. ARIZÒNICUM Gray. Stems taller (2 to 2⅓ ft. high), more branching, the panicle much larger; leaves 1½ to 2½ in. long.—Humboldt Co.; Mariposa Co.; se. to Ariz.

Tribe 4. **Astèreae.** Aster Tribe

Annual or perennial herbs or shrubs with bland watery juice. Herbage scentless, the foliage sometimes gummy or resinous. Leaves alternate. Receptacle naked. Bracts of the involucre commonly well imbricated. Disk-flowers yellow (except in some Lessingias, Pentachaetas and Conyzas), perfect in all ours except Baccharis. Rays present or absent. Anthers not caudate at base. Pappus of awns or bristles (paleaceous in Gutierrezia and Amphiachyris, none in Bellis).

34. **GUTIERRÈZIA** Lag.

Herbs or suffrutescent plants. Herbage resin-bearing, nearly glabrous. Leaves alternate, narrowly linear, entire. Heads very small, turbinate-campanulate to linear, numerous, in terminal cymes. Bracts of the involucre coriaceous, the outer shorter. Receptacle in ours flat. Flowers yellow; rays short, 1 to 11. Achenes angled or striate, mostly silky. Pappus paleaceous, its scales unequal in ours. (Name of a noble Spanish family.)

Flowers of disk and ray more than 1 or 2 each.
Ray-flowers 8 to 11; involucre turbinate ..... 1. *G. californica.*
Ray-flowers 3 to 7; involucre clavate-oblong ..... 2. *G. sarothrae.*
Flowers of disk and ray 1 or 2 each; involucre linear ..... 3. *G. lucida.*

1. **G. californica** T. & G. Stems several from a much-branched woody base, loosely branched above, ¾ to 1½ ft. high; herbage scabrous; heads corymbose; involucres turbinate, 2 to 2½ lines high, their bracts with roughish green tips; rays 8 to 11; disk-flowers 6 to 14; achenes densely silky; pappus of about 12 paleae.—Dry hills and plains: South Coast Ranges; upper San Joaquin Valley; coastal S. Cal.; e. to Ariz. Var. bracteàta Hall. Branchlets strongly divaricate or even geniculate, with numerous bract-like leaves, or these deciduous; heads few and large, solitary.—Between Banning and Seven Palms. (G. bracteata Abrams.)

2. **G. saròthrae** Britt. & Rusby. Matchweed. Bushy plant with numerous erect stems from a woody base, 1 to 2 ft. high; inflorescence cymose-paniculate, the heads solitary on short peduncles or 3 to 5 in terminal glomerules; involucres clavate-oblong, 1½ to 2 lines high, the bracts with minute green tips; disk- and ray-flowers each 3 to 7; pappus of 9 to 12 scales; achenes silky-pubescent.—Coastal S. Cal.; w. Mohave Desert; e. to Tex., thence n. to Man.

3. **G. lùcida** Greene. Straggling bush 1 to 1½ ft. high; herbage clear yellowish-green, very resinous; foliage sparse and lax; inflorescence cymose-paniculate, the numerous heads glomerate at the ends of the slender twigs; involucres linear, 1½ lines high; bracts closely appressed, almost destitute of greenish tips; disk-flowers reduced to 1 or 2, the ray-flowers 1, rarely 2; pappus of disk and ray of 8 to 10 scales; achenes silky.—Dry hills, 2000 to 4000 ft.: Mohave Desert; Inyo Co.

35. **AMPHIÀCHYRIS** Nutt.

Ours a low bush with entire leaves. Herbage glabrous. Flowers yellow, the heads nearly sessile and glomerate in small cymes. Heads radiate; ray-flowers pistillate, fertile; disk-flowers perfect, sterile. Bracts of the involucre thin, closely imbricated or slightly cohering, the outer more or less boat-shaped. Ray-achenes pubescent; disk-achenes glabrous. Pappus of ray-flowers, in our species, of few and short bristles, the bristles (chiefly on the outer side) united into 2 or 3 laciniate scales; pappus of disk-flowers of 5 to 20 weak flattened bristles, united at base, nearly or quite equaling the corolla, denticulate. (Greek amphi, on both sides, and achuron, chaff.)

1. **A. frémòntii** Gray. Bush 1 to 2 ft. high, with rigid divaricate branches; bark white after the first season; leaves obovate or elliptic, acute, narrowed to the sessile base or short petiole, 4 to 7 lines long; cymes terminal, compound, leafy-bracted; involucres ovoid, 2 lines high, the outer bracts broadly oblong, very obtuse, thin, the inner bracts narrow; rays 1 or 2, about 1 line long; disk-flowers 3 to 6.—Rocky mountain slopes or gravelly washes: Death Valley region from the Argus Range to the Funeral Range; e. into southern Nev.

36. **GRINDÈLIA** Willd. Gum Plant

Coarse perennial herbs, sometimes suffrutescent at base. Leaves obovate or spatulate to oblong-lanceolate, sometimes narrower, commonly serrate. Heads usually gummy, medium-sized or large, solitary on the branches, ours with rays. Involucre campanulate or hemispherical, the bracts many-ranked, foliaceous or firm-herbaceous, often with attenuate squarrose points. Achenes short, truncate, compressed or turgid, glabrous. Pappus of 2 to 8 very readily deciduous awns or small scales. Involucral cups of the budding heads completely filled with the white or cream-like gummy exudation. (Hieronymus Grindel, Russian botanist, professor at Riga and Dorpat.)

Involucre with conspicuous foliaceous bracts (except in var. davyi).....1. *G. robusta.*
Involucre without foliaceous bracts or with only a few small ones.
Stem and branches (at least above) and sometimes the leaves pubescent; plants 1 to 3 ft. high .....2. *G. rubricaulis.*
Herbage wholly glabrous.
Stems woody at base, 2 to 3½ ft. high; often with densely leafy sterile shoots.... 3. *G. cuneifolia.*
Stems herbaceous nearly or quite to the base, ½ to 2 ft. high; without sterile shoots; bracts of involucre with spreading or recurved tips.
Heads 2 to 2½ in. broad; leaf veins brownish.....4. *G. venulosa.*
Heads less than 1 in. broad; leaf veins not brownish.
Leaves clasping; heads 6 to 10 lines wide.....5. *G. camporum.*
Leaves not clasping; heads 3 to 4 lines wide.....6. *G. nana.*

1. **G. robùsta** Nutt. Gum Plant. Stems few to several, mostly erect, 1 to 2 ft. high; herbage glabrous or very slightly pubescent; leaves oblong to ovate or lanceolate, acute or sometimes wider above and obtuse, sharply serrate or denticulate or the uppermost entire, sessile or auriculate-clasping, 1 to 2 in. long; heads with foliaceous sometimes broad bracts, 2 to 5 in a terminal cyme, each rather long leafy branch one-headed; involucres ¾ to 1 in. broad; bracts with attenuate squarrose or recurved tips; mature achenes crowned with a mostly 1 or 2-dentate often oblique border; pappus-awns 2 to 8.—Along the seacoast: San Diego to Santa Barbara; n. to San Francisco; not plentiful. May-Aug. Var. LATIFÒLIA (Kell.) Gray. Stems robust; leaves large and broad, 1½ to 2½ in. long, 1 to 2 in. wide, subcordately clasping.—Santa Barbara Isls. (G. latifolia Kell.) Var. MARÍTIMA Jepson. Stems ascending or erect, 1 to 2 ft. high; leaves narrowly or broadly oblong to lanceolate, in a few cases wider above, obtuse, or mostly acute, more or less serrate; involucre ¾ in. broad; bracts linear-lanceolate, closely compacted, with erect or spreading tips; accessory foliaceous bracts few or several, unequal, ovate to lanceolate or linear, often deflexed.—Along the seaboard: Marin Co.; San Francisco; San Mateo Co. June-July. The foliaceous bracts are very variable in shape and size, even on the same plant, always more numerous on the head terminating the main axis, few or sometimes none on the heads terminating branches. (G. rubricaulis var. maritima Greene.) Var. PÀTENS Jepson. Stems 1 to 2 ft. high, mostly simple or with few strict 1-headed branches; herbage glabrous or finely puberulent; leaves narrowly oblong to oblanceolate, the lower narrowed to a petiole, 2 to 3½ in. long, the upper sessile, narrowed toward the base, serrate or often entire below the middle; involucre wholly or largely foliaceous, its bracts erect, nearly equal, linear or lanceolate, 1 to 2 lines broad, not glutinous-compacted, sometimes with an inner involucre of subulate or filiform bracts which are glutinous-compacted. — Hilltops in the Coast Ranges, not common. (G. patens Greene.) Var. PLATYPHÝLLA Greene. Stems erect, leafy, ½ to 1 ft. high; leaves broadly spatulate, obtuse, auriculate-clasping; involucres 7 lines wide, the foliaceous bracts ovate, few.—Monterey. July. Var. DÀVYI Jepson. Stems commonly clustered, erect, 2 ft. high, rarely simple, mostly with long 1-headed sparingly leafy peduncles; herbage glabrous, rarely puberulent, darker green than in the next species; basal leaves oblong or obovate, narrowed to a rather long, often winged petiole, serrate or coarsely and saliently toothed, 2 to 8 in. long, the cauline similar or sessile; heads naked; involucres ¾ to 1 in. broad, very gummy, the lanceolate bracts with subulate or filiform squarrose tips.—Valley lands about San Francisco Bay.

2. **G. rubricáulis** DC. Red-stem Grindelia. Stems commonly 2 ft. high, tufted, reddish or brownish, ending in a small corymb of about 3 or 4 heads

or one-headed; herbage scantily soft-pubescent when young, in age often glabrous; leaves 2 to 5½ in. long, oblong, serrate or disposed to be entire, the basal attenuate into a petiole as long as the blade, the cauline similar or sessile; heads small, ½ in. in diameter (not including the rays); involucral bracts lanceolate, not squarrose, very slightly or not at all glutinous, sometimes tomentose.—Ridges and hillsides of the Coast Ranges, in openly wooded country: Mt. Tamalpais; Sonoma; Napa Range. Var. INTERIÒRIS Jepson n. var. Basal leaves oblanceolate, the cauline oblong; involucre ¾ to 1 in. wide, the bracts spreading or reflexed.—Calaveras Co. foothills (Copperopolis, Davy 1383, type); Glenn Co.

3. **G. cuneifòlia** Nutt. MARSH GRINDELIA. Stems 2 to 3½ ft. high (commonly woody at base), ending in a corymbose panicle of several heads or the simple sterile shoots densely leafy at summit; leaves thick, oblong or cuneate-oblong, 2 to 5 in. long, with broadly sessile or clasping base, those of the flowering branches much reduced, oblong-ovate, entire or serrate; involucres 7 to 11 lines wide, the bracts lanceolate with tips erect or spreading.—Salt marshes: Humboldt Bay southward along the coast to San Mateo Co. Aug.-Sept. Stems sometimes flexuous. Var. PALUDÒSA Jepson. Stems 4 to 5 ft. high, with suffrutescent base 1 to 2 ft. high lasting through the winter; cauline leaves sometimes triangular-oblong, with subauriculate clasping base. —Marshes in San Francisco Bay region. Aug.

4. **G. venulòsa** Jepson n. sp. Stems herbaceous nearly or quite to the base, 1 to 2 ft. high; leaves obovate or spatulate, obtuse, clasping, serrulate, 1 to 2 in. long, the brownish veins terminating in brownish dots; heads large, 2 to 2½ in. broad; involucres 1 in. wide, the bracts acute or acuminate; rays 10 lines long; achenes obscurely bordered at summit; pappus-awns 5 to 8, stout, flattened, sparingly ciliate-scabrous or nearly smooth.—Humboldt Co. coast (Big Flat, Bolander 6493, type).

5. **G. campòrum** Greene. Fig. 924. Stems usually several from base, simple or sparingly branched above, white or yellowish, not leafy at base, ¾ to 2½ ft. high; herbage glabrous, often glutinous; leaves oblong to oblanceolate, clasping, saliently serrate, 1 to 2½ in. long, becoming small and bract-like above; heads solitary or loosely corymbose; involucres 6 to 10 lines wide, the bracts with slender recurved tips; disk-achenes compressed, with 2 pappus-bristles.—Dry hills and interior plains, 10 to 2500 ft.: throughout cismontane Cal., but mostly not along the coast line. June-Sept.

924. Grindelia camporum Greene; *a*, summit of flowering stem x 1; *b*, leaf x ½; *c*, disk-fl. x 2½.

6. **G. nàna** Nutt. Stems many from a somewhat woody branched root-crown, slender, somewhat branched above, ¾ to 1¾ ft. high; herbage glabrous, more or less glutinous; leaves oblanceolate, or the upper linear-lanceolate, ¾ to 1¼ (or the lower 2½) in. long; heads small, corymbosely clustered; involucres globose, 2½ to 4 lines wide, the bracts with recurved tips; achenes narrow, truncate or bidentate at summit; pappus-awns mostly 2.—Dry hills and valleys, 2000 to 3000 ft.: Siskiyou Co. to Modoc Co.; n. to Wash., e. to Wyo. Sept.

37. **ACAMPTOPÁPPUS** Gray

Low round-topped shrubs with slender rigid stems and nearly glabrous herbage. Leaves small, entire, sessile. Heads spherical, yellow-flowered, discoid or radiate. Flowers all fertile. Involucral bracts closely imbricated in about 3 series, very broad and obtuse, a little convex and coriaceous, pale, the margins thin-scarious and erose-fimbriate. Disk-corollas with funneliform tube and acute translucent lobes. Achenes short-turbinate, very heavily and densely long-villous. Pappus of about 20 to 30 silvery awns, some lanceolate-flattened at tip and equaling the corolla, others bristle-like and a little shorter, all persistent. (Greek akamptos, unbending, and pappos, pappus.)

Heads depressed-globose; rays none.....1. *A. sphaerocephalus*
Heads spherical, larger; rays present.....2. *A. shockleyi*

1. **A. sphaèrocéphalus** Gray. Depressed-globose bushes 1 to 1½ ft. high with striate stems; herbage pale, glabrous or nearly so, leaves linear or linear-spatulate, acute, 4 to 9 lines long, sometimes fascicled; heads solitary or in loose clusters on the ends of the branches; involucres 3 to 4 lines high, the bracts coriaceous, commonly with a subapical greenish spot; rays none.—Desert mesas and flats, 2000 to 3500 ft.: e. slope Cuyamaca and San Jacinto mountains; widely distributed in the Larrea belt of the Mohave Desert; Inyo Co.; e. to Ariz. and Utah.

2. **A. shóckleyi** Gray. Shrub; peduncles leafy only below, bearing solitary heads; leaves narrowly obovate to oblanceolate, 3 to 9 lines long; heads ½ or mostly ¾ to 1 in. high; rays 10 to 12, bright yellow, 4 to 6 lines long; outer bracts of involucre with a large green spot at tip.—Death Valley region; e. into southern Nev.

38. **STENOTÓPSIS** Rydb.

Shrubs or suffruticose plants with glabrous herbage and evergreen foliage. Leaves alternate, narrow and entire, resinous-dotted in ours. Heads large and broad, solitary on the peduncles. Involucre hemispherical, its bracts little imbricated (in 2 or 3 series), membranous with scarious margins, closely appressed. Flowers yellow; rays several to many. Achenes oblong, somewhat compressed. Pappus of slender bristles, permanently white. (The genus Stenotus, and Greek opsis, resemblance.)

925. Stenotopsis linearifolius Rydb.; *a*, fl. branch x ½; *b*, fl. x 2.

1. **S. lineàrifólius** (DC.) Rydb. Fig. 925. Shrub 1 to 2 or 4 ft. high, with balsamic sticky herbage; flowering branchlets more or less fastigiate, leafy below, nearly naked above and bearing solitary heads; leaves much crowded or fascicled, linear and narrowed toward the base, or subfiliform, ½ or ¾ to 2 in. long, ½ to 1½ lines wide; heads hemispherical, 1 to 2 in. broad; bracts of the involucre in 2 or 3 rows, all nearly equaling the disk, linear or oblong, acute or commonly acuminate, greenish, the inner with broad scarious fimbriolate margins; rays 11 to 18, oblong-lanceolate, 4 to 8 lines long; disk-flowers numerous; achenes white-silky; pappus white, soft and deciduous.—Mountain slopes and desert mesas, 2000 to 5000 ft.: San Diego Co. to Mt. Diablo, s. Sierra Nevada and Inyo Co.; e. to

southern Utah and Ariz., s. to L. Cal. Mar.-May. (Aplopappus linearifolius DC. Stenotus linearifolius T. & G.) Passes by numerous intergrades into: Var. INTÈRIOR Mcbr. Fig. 926. Leaves shorter (mostly ½ to ¾ in. long); heads smaller; rays only 4 to 5 lines long.—Mohave Desert.

926. Stenotopsis linearifolius Rydb. var. interior Mcbr.; fl. branch x ⅔.

39. **ERÌCAMÈRIA** Nutt.

Low evergreen shrubs or suffrutescent plants. Herbage glabrous, rarely obscurely puberulent. Leaves resinous and punctate, narrowly linear or terete and often heath-like, rarely obovate or oblanceolate, always entire. Flowers yellow, the heads in terminal panicles, cymes or racemes. Rays present or none. Involucre turbinate, its bracts chartaceous or coriaceous, regularly imbricated. Achenes more or less prismatic. Pappus-bristles slender, scabrous, dull white or yellowish, in age reddish. (Greek ereike, the European heath, and meris, part, the minute evergreen leaves of the first-known species heath-like.)

Leaves filiform to linear (or sometimes oblanceolate in no. 9).
- Involucral bracts commonly about 15 to 25, rather firmly imbricated even in age.
  - Rays present; leaves filiform.
    - Leaves mostly 5 to 10 lines long (or to 1½ in.); heads in panicles; plains and foothills of coastal S. Cal.
      - Outer involucral bracts obtuse; panicles commonly much elongated or racemose ..... 1. *E. palmeri.*
      - Outer involucral bracts acuminate; panicles congested-racemose, rarely loose ..... 2. *E. pinifolia.*
    - Leaves 1 to 2 lines long; heads corymbose-paniculate; sand dunes along the coast ..... 3. *E. ericoides.*
  - Rays none.
    - Heads in loose oblong panicles or racemes.
      - Leaves terete.
        - Involucral bracts tipped with a glandular spot.... 4. *E. teretifolia.*
        - Involucral bracts without apical spot..... 5. *E. paniculata.*
      - Leaves filiform but flat.
        - Involucral bracts without a resin line..... 6. *E. cooperi.*
        - Involucral bracts with resin-thickened midnerve.. 7. *E. brachylepis.*
    - Heads in close rounded cymes.
      - Leaves filiform or becoming so..... 8. *E. arborescens.*
      - Leaves broadly linear to oblanceolate..... 9. *E. parishii.*
- Involucral bracts 8 to 10, very loose in age; rays 1 or 2 or none; herbage minutely pubescent ..... 10. *E. monactis.*

Leaves obovate or oblanceolate; rays present or none..... 11. *E. cuneata.*

1. **E. pálmeri** (Gray) Hall. Low much-branched bush (1 to 2 ft. high), the branchlets very slender; herbage minutely puberulent or almost glabrous; leaves narrowly linear, resinous and punctate, 3 to 10 lines or to 1½ in. long, mostly with shorter ones fascicled in the axils; heads 3 to 4 lines high, borne in an elongated commonly narrow panicle; involucres narrow, about 3 lines high; bracts obtuse, the tips greenish, the narrow white margins shortly ciliate; rays 3 or 4, short; achenes silky-hirsute with ascending hairs.—Plains and foothills, common: coastal S. Cal.; e. to the Colorado River; s. to L. Cal. (Aplopappus palmeri Gray.)

2. **E. pinifòlia** (Gray) Hall. Stout spreading shrub 2 to 5 ft. high; herbage nearly glabrous, resinous, the leaves minutely but sparingly punctate, or not at all punctate or only on the involute margins; leaves filiform to narrowly

927. Ericameria ericoides Jepson; *a*, fl. branchlet x 1; *b*, disk-fl. x 4.

linear, 4 to 9 or 15 lines long, the fascicled ones mostly shorter (3 to 5 lines long); vernal heads few and solitary, their involucres hemispheric, 4 to 5 lines broad, closely subtended by long leaves; rays 15 to 25; heads of the regular (or autumnal) flowering numerous, densely racemose, or sometimes loosely paniculate; involucres turbinate, 2 to 3 lines broad; rays 6 to 10, short; bracts acuminate or the innermost only acute, with narrow membranous margins woolly-ciliolate at the green tips, the outermost subulate and passing into the bract-like leaves of the flowering branchlets; achenes lightly pubescent, glabrate; pappus reddish or sordid.—Foothills in the chaparral: San Gabriel, San Bernardino and San Jacinto mountains; s. to San Diego Co. (Aplopappus pinifolius Gray.)

3. **E. ericoides** (Less.) Jepson. Fig. 927. Mock Heather. Heather-like shrub 1 to 2¾ ft. high, the main stems decumbent or ascending, bearing numerous erect branchlets; herbage slightly pubescent; leaves linear-terete, 1 to 2 lines long, crowded or fascicled; heads numerous, 3 to 4 lines high, corymbose-paniculate; bracts of involucre tomentose-ciliolate, the inner narrowly oblong, acute, the outermost lanceolate, acuminate; rays about 5, 2 lines long; achenes cylindric, striate, glabrous; pappus dull white, aging slightly brown. —Sand dunes along the coast: Marin Co. to Los Angeles Co. Aug.-Sept. (Aplopappus ericoides H. & A.)

4. **E. téretifòlia** Jepson n. comb. Glabrous shrub 1 to 3 ft. high; herbage dark green, balsamic-resinous; leaves terete, conspicuously punctate, 3 to 7 lines long; heads narrowly oblong, 4 to 5 lines long, in dense spikes, or somewhat capitately congested at the ends of the branches; involucres narrow, 2 to mostly 3 lines high; bracts linear, obtuse, all except the innermost tipped with a greenish glandular spot; achenes linear, silky-villous.—Cañon walls and rocky ledges: Funeral and Panamint ranges; w. to e. slope Sierra Nevada in Inyo Co. and to the Tehachapi Range; e. to southern Nev. (Bigelovia teretifolia Gray. Linosyris teretifolia D. & H.)

5. **E. paniculàta** (Gray) Rydb. Erect shrub 4 to 6 ft. high, the stems many from the base, much-branched above and slender; herbage paler than in E. teretifolia; leaves filiform, punctate, ¾ to 1 or 1½ in. long; panicle profusely branched; heads 4 to 5 lines high; involucral bracts straw-color, thin, obtuse, but subacutely pointed, without glandular spot at apex, the inner ones 2½ to 3 lines long.—Sandy or gravelly washes or in cañon bottoms in the deserts: Colorado Desert; Mohave Desert; Inyo Co.; e. to Ariz. and southern Nev. (Bigelovia paniculata Gray.)

6. **E. coöperi** (Gray) Hall. Low shrub, branched from the base, the stems slender; herbage minutely tomentose, resinous-punctate; leaves filiform, thickish, 5 to 10 lines long; heads few in a terminal cluster, 6 to 8-flowered; rays none; involucral bracts rather few, narrowly oblong, the outer ones ovate, chartaceous, without green tips; achenes turbinate, silky-villous.—Providence Mts. in the Mohave Desert, the only known locality. (Bigelovia cooperi Gray.)

7. **E. brachýlepis** (Gray) Hall. Shrub 3 to 6 ft. high, branched from the base, the branchlets crowded with leaves; leaves viscid and resinous-punctate, glabrous, filiform, 5 to 12 lines long; heads racemose or narrowly paniculate

at the ends of the leafy branchlets, 8 to 12-flowered; involucres 2 to 2½ lines high; bracts oblong, obtuse or only acutish, with a brown resinous-thickened midnerve and ciliolate margins, the outermost passing into minute bracts of the peduncle; rays none; achenes linear, canescent.—S. San Diego Co.: Campo; Potrero; s. to L. Cal. (Bigelovia brachylepis Gray.)

8. **E. arboréscens** (Gray) Greene. GOLDEN FLEECE. Erect shrub with fastigiate very leafy branches, 3 to 10 (or 15) ft. high; leaves narrowly linear, or closely revolute and becoming filiform, resinous-punctate, 1 to 2 in. long; heads 2½ to 3½ lines high; bracts of the involucre lanceolate, acute, 2 lines long or less; rays none, rarely present; achenes canescent, somewhat quadrangular; pappus permanently dull white, its bristles unequal.—Open dry chaparral or chamise slopes in the foothills, mostly 1000 to 2000 ft.: Coast Ranges from Napa Co. to Monterey Co. and s. to Santa Barbara Co.; Sierra Nevada from Amador Co. to Tulare Co. Sept.-Nov. (Bigelovia arborescens Gray.)

9. **E. paríshii** (Greene) Hall. Erect shrub 3 to 8 ft. high, the branchlets very leafy up to the inflorescence; leaves oblanceolate or linear, resinous-punctate, entire, narrowed at base, acute, 1½ to 2 in. long, 1½ to mostly 3 lines wide; heads discoid, 10 to 12-flowered, borne in terminal rounded cymes 1 to 2 in. high; bracts of the cymes linear-subulate; involucres 2½ to 3 lines high, their bracts lanceolate, very acute, with a distinct midrib, but no green tip; achenes turbinate, minutely silky.—Lower portions of the chaparral belt: cismontane Cal.; s. to L. Cal. (Bigelovia parishii Greene.)

928. Ericameria monactis McCl.; *a*, fl. branchlet x 1; *b*, head x 2¼; *c*, disk-fl. x 3.

10. **E. monáctis** (Gray) McCl. Fig. 928. Shrub 1 to 3½ ft. high, with numerous leafy branchlets and deep-green foliage; herbage obscurely and minutely pubescent, the axillary leaves always and the primary leaves sometimes resinous-punctate; leaves linear or linear-spatulate, flat, acute, 3 to 8 lines long, commonly with minute fascicled ones in the axils, especially the lower; heads in round-topped terminal cymes; involucres narrowly campanulate, 2 to 2½ lines high; bracts loosely imbricated, chartaceous, obtuse or acute; rays 1 or 2, or none in some heads, occasional plants with all the heads discoid; disk-flowers 5 to 8; achenes white-pubescent.—Arid mesas, 1000 to 4000 ft.: Riverside; Tejon Pass, s. entrance; Mohave Desert and neighboring ranges; Inyo Co.; e. to southern Nev. (Aploppapus monactis Gray. Chrysothamnus corymbosus Elmer. Acamptopappus microcephalus Jones.)

11. **E. cuneàta** (Gray) McCl. Dark green shrub ½ to 4 ft. high, freely branching; herbage glabrous but balsamic-glutinous and resinous-punctate; leaves thick, oblanceolate to obovate, a little undulate, obtuse but commonly mucronate at apex, cuneately narrowed below to a short petiole-like base, 2 to 4 lines long; heads 4 to 6 lines high, in small compact cymes or sometimes solitary; involucre turbinate, 3 to 4 lines high; bracts lanceolate to linear, chartaceous, with firm brown or greenish midrib and silvery-scarious margins, somewhat obtuse but usually cuspidate-tipped, the outermost passing into minute bracts of the peduncle; rays 1 to 5 or none; achenes silky-strigose; pappus-bristles copious, about equal to and as long as the corolla, brown.—Rocky ledges and cliffs, 5000 to 8000 ft.: Sierra Nevada from Placer

Co. to Tulare Co.; San Jacinto Mts. (Aplopappus cuneatus Gray.) Var. SPATHULÀTA Hall. Leaves 4 to 8 lines long, 3 to 5 lines wide, very obtuse or even retuse, less commonly mucronate, spatulately narrowed to a petiole-like base; rays none or rarely present.—Inyo Co.; Mohave and Colorado deserts; cismontane S. Cal.; s. to L. Cal. (Bigelovia spathulata Gray. Chrysoma merriami Eastw.)

40. **HAPLOPÁPPUS** Cass.

Leafy-stemmed perennial herbs commonly with a thickened or fusiform taproot (one species shrubby and one annual). Leaves serrate, pinnately toothed or cleft, or sometimes entire. Heads radiate, usually many-flowered, the flowers yellow. Involucral bracts more or less imbricated. Achenes turbinate to linear, somewhat flattened, silky-villous to glabrous. Pappus of numerous bristles, sordid or yellowish. (Greek, haploos, simple, and pappos, down, in allusion to the absence of an outer pappus.)

A. Involucral bracts and the lobes or teeth of the leaves bristle-tipped; bracts well imbricated.

Annual; stems leafy, only a few in. high; pappus-bristles somewhat paleaceous..... 1. *H. gracilis.*

Perennial; stems reedy, 1 to 1¾ ft. high, the leaves much reduced; pappus-bristles not at all paleaceous.....2. *H. junceus.*

B. Involucral bracts and lobes or teeth of leaves not bristle-tipped.

Plants shrubby at base, 3 to 4 in. high; herbage glandular.....3. *H. eximius.*

Plants from a thick root-crown or fusiform root, mostly much taller, herbage not glandular (except in *H. hirtus*).

Outer involucral bracts foliaceous, usually much exceeding the inner and the flowers.

Basal leaves 4 to 6 in. long; herbage more or less puberulent; montane species... 4. *H. carthamoides.*

Basal leaves ¾ to 1 ft. long; herbage glabrous; species of the San Francisco Bay region.....5. *H. longifolius.*

Outer involucral bracts not foliaceous and not exceeding the inner and the flowers.

Heads racemosely arranged (scattered in var. stenocephala); involucral bracts well imbricated, in about 4 series.....6. *H. racemosus.*

Heads not racemosely arranged; involucral bracts loosely if at all imbricated, in fewer series.

Herbage glandular throughout; stems very leafy; achenes villous..... 7. *H. hirtus.*

Herbage not glandular; stems moderately leafy.

Heads corymbose-paniculate on long peduncles; herbage glabrous; achenes silky-villous .....8. *H. lanceolatus.*

Heads terminating the stems or short branchlets.

Achenes glabrous; herbage hirsute-pubescent to glabrate; basal leaves laciniately toothed.....9. *H. apargioides.*

Achenes silky-villous; herbage woolly, becoming glabrate above; basal leaves entire or coarsely toothed (not laciniate)... 10. *H. gossypinus.*

1. **H. grácilis** (Nutt.) Gray. Stem erect, leafy, branched at or above the base, 1 to 8 in. high, arising from an annual root; herbage hirsute with white hairs; leaves elliptic or oblong in outline, 2 to 6 lines long, pinnately divided into somewhat crowded linear lobes, or only toothed, each lobe or tooth tipped with a long white bristle; heads 6 to 8 lines broad, the branches one-headed; involucres campanulate, 2½ lines high; bracts linear-lanceolate, well imbricated in several ranks, bristle-tipped; rays yellow, well exserted, 3 lines long; achenes silky-canescent; pappus-awns unequal, somewhat paleaceous toward the base.— Desert ranges, e. Mohave Desert, 4000 ft.: Providence Mts.; New York Mts.; e. to Col., s. to Mex. June. (Sideranthus gracilis Rydb. Eriocarpum gracile Greene.)

2. **H. júnceus** Greene. Stems rigid, erect, several from a branched woody base, rush-like on account of the small or few leaves, 1 to 1¾ in. high, ending above in a corymbose panicle; herbage glabrous or sometimes tomentose; leaves oblong to linear, 3 to 9 lines long, serrate or pinnatifid (the lobes or teeth bristle-tipped), or sometimes entire, the uppermost linear, entire, 1 to 3 lines long; heads turbinate to hemispherical, rather long-peduncled in the panicle; involucres 3 to 3½ lines high; bracts linear, cuspidate, well imbricated in several series, a narrow greenish spot below the cusp or bristle; rays pale yellow, well exserted, 2 lines long; achenes pubescent; pappus sordid.— Dry or sandy soil, San Diego Co.: Valley Center; San Diego Falls; Mt. Tecate; Descanso; Cottonwood grade; s. to L. Cal.

3. **H. exímius** Hall. Stems several to many, densely tufted on the branched crown of a taproot, ascending or erect, simple, leafy, one-headed, 3 to 6 in. high; herbage glandular, fragrant; leaves obovate or broadly oblanceolate to oblong, coarsely toothed, attenuate to a narrow base or petiole, the whole ¾ to 2¼ in. long; heads radiate; involucres campanulate, 3 lines high, the outer bracts oblong, foliaceous, the inner lanceolate, pinkish tinged; rays 3 to 4 lines long; achenes narrowly cylindric, silky, 2 lines long; pappus-bristles scabrous.—Montane, in rocky places, 8800 to 10,000 ft.: e. summits of the Sierra Nevada from Eldorado Co. to Inyo Co. July-Aug.

4. **H. cárthamoides** (Hook.) Gray. Stems several, tufted on the branched root-crown of a thick fusiform root, ascending or decumbent, leafy, simple and one-headed, 3 to 5 in. high; herbage finely canescent or puberulent; leaves obovate to oblanceolate, entire or minutely spinulose-toothed, 1 to 3 in. long, narrowed to a petiole ½ to 2 times as long; heads large, 6 to 9 lines broad, 1 in. high; involucres campanulate, 6 to 9 lines high, oblong or sometimes lanceolate, obtuse or sometimes acute and spinescent-tipped, the outermost foliaceous, often much exceeding the flowers; achenes glabrous.—Dry flats or ridges, 4000 to 6000 ft.: Mt. Eddy, Siskiyou Co.; Modoc Co.; n. to Wash. and Ida. June-Aug. Var. CUSÍCKII Gray. Stems 3 to 4 in. high; heads narrower; achenes puberulent.—Eagle Lake, Lassen Co.; n. to Ore. (Pyrrocoma cusickii Greene.)

5. **H. longifòlius** Jepson n. comb. Stems leafy, erect, 1 ft. high, several from a thick taproot; herbage glabrous; leaves mostly entire, the basal oblanceolate, ¾ to 1 ft. long, the cauline oblong or oblong-lanceolate, clasping, 1 to 2 in. long; heads mostly solitary, terminal, leafy-bracteate; involucres broadly turbinate, ¾ in. high; involucral bracts spatulate or oblanceolate, green-tipped, subequal; rays numerous.—Mt. Eden, w. Alameda Co. May. (Pyrrocoma longifolia Greene.)

6. **H. racemòsus** (Nutt.) Torr. Stems several from the thick root-crown, erect or ascending, leafy, 9 to 18 in. high, simple, ending above in a spike-like inflorescence; root-crown chaffy with old leaf-bases; herbage glabrous or the leaves and bracts scabrous-ciliate; basal leaves oblanceolate to oblong-oblanceolate, minutely spinulose-ciliate, petioled, the whole 2 to 6 in. long; cauline leaves linear to narrowly lanceolate, sessile, ¾ to 2 in. long; heads radiate, solitary in the axils of the upper leaves and thus racemose; involucres turbinate, 2½ to 3½ lines high; bracts oblong to broadly ovate, well imbricated, the green tips somewhat spreading; rays yellow, well exserted, 2 to 3 lines long; achenes almost glabrous; pappus sordid or yellowish.—Saline flats, 10 to 4000 ft.: San Mateo Co.; upper Napa Valley; Del Norte Co.; Shasta Valley, Siskiyou Co.; n. to Ore.; e. to Nev. (Pyrrocoma racemosa T. & G.) Var. GLOMERÉLLUS Gray. Leaves entire or denticulate; heads narrower and smaller, disposed to be fascicled in 2s or 3s in the axils of the small upper leaves; involucres often turbinate; achenes nearly glabrous.—Arid areas, 3000 to 4000 ft.: Inyo Co.; e. to Nev., n. to Ore. Var. VIRGÁTUS Gray. Leaves narrower; heads smaller.—E. side Sierra Nevada from Sierra Co. to Mono Co.; upper San Joaquin Valley. Var. STENOCÉPHALUS Gray. Low, only 2 to 3 in. high; heads scattered, narrow, few-flowered.—Sierra Co.

7. **H. hírtus** Gray. Stems several from the thick root-crown, ascending or decumbent at base, leafy, 6 to 13 in. high, ending above in a few-headed panicle; herbage glandular-viscid, hirsute-pubescent throughout; basal leaves oblong-ovate to linear-lanceolate, serrate or the teeth coarsely laciniate, 1 to 3½ in. long, the petioles ¼ to 1½ times as long; cauline leaves linear or narrowly oblong to lanceolate, 1 to 2½ in. long, sessile by a broad base; panicle commonly racemose; heads radiate; involucres turbinate to hemispherical, 4½ lines high; bracts lanceolate, unequal, 3-ranked, somewhat spreading at tip; achenes villous; pappus yellowish.—Montane: Lassen and Modoc Cos.; n. to Wash. July. (Pyrrocoma hirta Greene.)

8. **H. lanceolàtus** (Hook.) T. & G. Stems few or several from a thick root-crown chaffy with old leaf-bases, erect or ascending, somewhat leafy but the leaves mainly basal, simple but 2 or 3-forked at summit, 8 to 16 in. high;

herbage glabrous; basal leaves oblanceolate to narrowly oblong, serrate or somewhat saliently toothed, attenuate to a petiole, the whole 2 to 8 in. long; cauline leaves narrowly oblong to lanceolate, with broad clasping base, 1 to 2 in. long; heads campanulate, long-peduncled, 2 or 3 in the corymb; involucres broadly campanulate, 3 to 4 lines high; bracts lanceolate or oblong, green-tipped, imbricated; rays yellow, well exserted, 2 to 3 lines long; achenes silky-villous; pappus yellowish.—Modoc Co.; n. to B. C., e. to Col. (Pyrrocoma lanceolata Greene.)

9. **H. apárgioïdes** Gray. Stems several from the simple or branched root-crown of a very thick root, decumbent, 3 to 5 (or 11) in. high; root-crown densely sheathed with the bases of old leaves; herbage glabrate to slightly villous-pubescent; leaves mostly basal in a basal tuft, lanceolate to narrowly oblanceolate, acuminate, serrate or laciniately toothed, 1½ to 4 in. long; heads radiate, hemispherical, terminating the stems, rarely 1 or 2 below the main head on short lateral branchlets; involucres 3 to 5 lines high; bracts lanceolate to oblong, the inner purplish-tipped; rays 3 lines long; achenes glabrous.—Grassy meadows, 8000 to 10,000 ft.: San Bernardino Mts.; Sierra Nevada from Tulare Co. to Sierra Co.; e. to Nev. July-Aug. (Pyrrocoma apargioides Greene.)

10. **H. gossýpinus** (Greene) Hall. Stems decumbent at base, ascending, 6 to 10 in. high, several from a thick fusiform root; herbage white-tomentose becoming more or less glabrate above; leaves oblanceolate or oblong-oblanceolate, entire or spinose- serrate, the cauline sessile, the basal long-petioled, 1 to 5 in. long; heads radiate, hemispherical, solitary at the ends of the stems or branchlets; involucre 4½ lines high, the bracts lanceolate or linear, spinescent-tipped, somewhat unequal; rays yellow, well exserted; achenes silky-villous; pappus yellowish-white.—San Bernardino Mts. Aug. (Pyrrocoma gossypina Greene.)

41. **STÉNOTUS** Nutt.

Depressed cespitose plants with narrow entire leaves. Heads large, solitary on the peduncles. Involucre hemispherical to campanulate, its bracts little imbricated, closely appressed, in 2 or 3 series. Flowers yellow; rays several to many. Achenes oblong, narrowing toward base, somewhat compressed. Pappus of slender bristles permanently white. (Greek stenotes, narrowness, in reference to the leaves.)

Leaves very narrow, linear-spatulate to almost filiform, not nerved.....1. *S. stenophyllus.*
Leaves broader, spatulate to oblanceolate, mostly 3-nerved.....2. *S. acaulis.*

1. **S. stenophýllus** (Gray) Greene. Caespitose plants 2½ to 4 in. high; flowering stems many from the much-branched and depressed woody base, simple, densely leafy, bearing a nearly naked one-headed peduncle about twice as long as the leafy portion; herbage glandular, scabrous; leaves linear-spatulate to almost filiform, 4 to 8 lines long; involucres broadly turbinate to hemispherical, 3 to 4 lines high, the linear equal bracts in 2 rows, rays rather broad, 3 to 4 lines long, well exserted; achenes densely villous, narrowed towards base, 1½ to 2 lines long.—Gravelly slopes, 4000 to 5000 ft.: Modoc Co.; n. to Wash. May-June. (Haplopappus stenophyllus Gray.)

2. **S. acáulis** Nutt. Plants 2 to 6 in. high, with the habit of no. 1; leaves mostly basal, the erect flowering stems sparsely leafy or naked; herbage (especially the lower surface of the leaves) scabrous and viscid; leaves oblanceolate to spatulate, conspicuously 3 (or 5)-nerved, ½ to 1½ in. long; involucres 3 to 4 lines high, their bracts ovate to ovate-lanceolate, somewhat unequal, in 2 ranks; rays broad, 3 to 4 lines long, well exserted; achenes densely villous, narrowed towards base, 1½ lines long.—Rocky slopes, 8200 to 9600 ft.: Pyramid Peak; Mt. Tallac; Castle Peak; Warner Mts.; n. to Wash., e. to Utah. July-Aug. (Aplopappus acaulis Gray.) Var. KENNÈDYI Jepson n. var. Plants 4 to 5 in. high; herbage viscid, the leaves somewhat glandular with markedly scabrous margins, otherwise nearly glabrous; leaves oblanceolate, conspicuously veined, ¾ to 1½ in. long; involucres 4 lines high, their bracts ovate to lanceolate, unequal, in about 3

ranks; achenes glabrous.—Plumas Co. (hills above Red Clover Valley, Heller & Kennedy 8696, type).

42. **ISÓCOMA** Nutt.

Rigid plants, somewhat woody at base, with thickish leaves. Heads rayless, borne in glomerules which are terminal on short lateral branches or disposed in terminal cymes or panicles. Involucral bracts coriaceous, closely imbricated, the tips herbaceous, but appressed. Flowers permanently yellow. Corolla-tube slender, the throat ventricose or obliquely dilated, its segments erect or more or less connivent about the style. Achenes longitudinally striate or ribbed, the intervals silky-pubescent or -hirsute. Pappus of numerous sordid bristles, the inner longest and often distinctly flattened. (Greek isos, equal, and koma, a tuft, the florets equal, not unequal as in Lessingia.)

1. **I. venèta** (H.B.K.) Greene var. **vérnonioides** Jepson. Stems freely branching, erect, somewhat woody below, 1 to 2 ft. high, very leafy, commonly with fascicled leaves in the axils; herbage with a rather close and somewhat glandular indument, the stems villous below; leaves linear to oblong or obovate, serrate or entire, sessile, ¼ to 1½ (or 2) in. long; heads disposed in a dense terminal corymb; involucres 3 to 4½ lines high; bracts more or less rounded or obtuse at apex, but also shortly or minutely acute; achenes 1½ lines long; pappus of rather rigid and unequal bristles.—Subsaline plains, 20 to 1500 (or 4000) ft.: coastal S. Cal., n. to San Luis Obispo Co., upper San Joaquin Valley and Inyo Co. (I. vernonioides Nutt.) Var. ARGÙTA Jepson. Low bush 7 to 15 in. high; leaves pinnately cleft into acute lobes or only deeply toothed.—Lower Sacramento Valley; Santa Clara Valley. (Isocoma arguta Greene.) Var. SÈDOÌDES Jepson n. comb. Stems decumbent or ascending; herbage subglabrous; leaves obovate, succulent, ¾ to 1½ in. long; heads a terminal capitate cluster.—Santa Cruz Isl. (I. sedoides Greene.) Var. ACRADÈNIA Hall. Bark of the main branches white and shining; leaves pale, entire or toothed, commonly glabrous, the fascicled ones few; heads few in close clusters, the clusters in somewhat loose panicles.—Saline flats: Colorado Desert; Mohave Desert; upper San Joaquin Valley. (Bigelovia acradenia Greene.) Var. DECÚMBENS Jepson n. comb. Stems very slender, decumbent; inflorescence corymbose, the heads solitary on the branches, rarely 2.—Depressions on the mesas, San Diego Co. (Bigelovia veneta var. decumbens Bdg.)

43. **HAZÁRDIA** Greene

Shrubs or bushes with brittle ascending stems, or one species an herb. Herbage tomentose, or quite glabrous, or glandular, never resinous-punctate. Leaves coriaceous, entire or spinulose-serrate. Heads 20 to 40-flowered, borne in spikes, racemes, or panicles. Involucre turbinate or campanulate, its bracts numerous, closely imbricated. Rays yellow, changing to purple, or wanting. Disk-corollas yellow, changing to brownish-purple. Achenes linear, 4 to 6-nerved. Pappus reddish. (Barclay Hazard, who assisted E. L. Greene in reaching the Santa Barbara Islands.)

Shrubs; coastal S. Cal.
- Herbage white-tomentose; tips of involucral bracts erect ..... 1. *H. cana.*
- Herbage bright green; involucral bracts with spreading or recurved tips ..... 2. *H. squarrosa.*

Herb; involucral bracts with erect tips; Sierra Nevada mainly ..... 3. *H. whitneyi.*

1. **H. càna** Greene. Large shrub; herbage densely white-lanate, the tomentum sometimes deciduous from the foliage; leaves obovate to oblanceolate, entire to sharply serrate, 1½ to 8 in. long; heads borne in a loose panicle; involucres campanulate, densely woolly, 5 to 6 lines high; bracts erect with thickened tips; rays inconspicuous, yellow, turning purple (sometimes wanting); achenes canescent, prominently nerved.—Rocky slopes, Santa Barbara Isls.: San Clemente, Santa Cruz, and Santa Rosa Isls. July.

2. **H. squarròsa** Greene. Bush 1 to 3 ft. high, the erect stems minutely roughish, pubescent or scaberulous; leaves oblanceolate to obovate, rounded at apex, sessile and somewhat clasping at base, sharply serrate, glutinous or glandular-spotted, ½ to 1 (or 2) in. long; heads spicate or more commonly racemosely thyrsoid or paniculate; involucres turbinate, 5 to 7 lines high;

bracts imbricated in many series, the acutish green tips glandular-granuliferous and recurved or squarrose-spreading; rays none; achenes glabrous or sparsely hairy.—Rocky points, mostly in the chaparral belt, 200 to 4000 ft.: along the coast from the Santa Lucia Mts. to San Diego; e. to San Bernardino; Santa Cruz Isl. Sept.-Oct. Var. OBTŪSA Jepson n. comb. Involucres 6 to 7 lines high, their bracts very obtuse or truncate but with a short cusp; achenes quite glabrous.—San Emigdio Mts. (Hazardia obtusa Greene.)

3. **H. whítneyi** (Gray) Greene. Stems simple below, several from a woody root-crown, 12 to 17 in. high; herbage glandular-puberulent, the leaves bright green; leaves broadly oblong and usually a little narrowed below, rarely obovate, serrate, sessile, ½ to 1⅜ in. long; heads 7 to 11 lines broad, solitary on the ends of the branchlets in a loose panicle, sometimes subsessile or shortly peduncled along the upper part of the main stem and the inflorescence thus spicate; involucres 5 lines high, the bracts linear, chartaceous-margined, with erect tips; rays few, 3 lines long; pappus reddish.—Montane, 7000 to 9500 ft.: Scott Mts.; Sierra Nevada from Mariposa Co. to Tulare Co. (Aplopappus whitneyi Gray.)

44. **MACRONÈMA** Nutt.

Low bushy undershrubs with short branches, leafy up to the heads. Involucre turbinate to campanulate, with foliaceous outer bracts passing into the leaves. Receptacle naked. Flowers all perfect, yellow, the rays few or wanting, the disk 5-lobed. Style-branches stigmatic throughout, with long filiform appendages. Achenes slender, compressed, 5-nerved, soft-pubescent. Pappus of numerous soft white bristles. (Greek makros, long, and nema, a thread.)

Heads discoid; branches white-tomentose ..... 1. *M. discoidea.*
Heads radiate; branches not white-tomentose.
  Branches and herbage glandular; involucre not at all tomentose ... 2. *M. suffruticosa.*
  Branches and herbage not glandular, the herbage glabrous to puberulent or tomentose ..... 3. *M. greenei.*

1. **M. díscoidea** Nutt. Low branched undershrub 4 to 8 in. high, the stems and branches densely white-tomentose; leaves oblong to oblanceolate, sessile, green, glandular-puberulent, 4 to 10 lines long; heads solitary or somewhat clustered at the ends of the branchlets; involucres turbinate to campanulate, 4 to 5 lines high, the inner bracts few, lanceolate; rays none.—Rocky slopes, 8000 to 11,000 ft.: Sierra Nevada from Tulare Co. to Eldorado Co.; n. to Ore., e. to Col. July-Sept. (Aplopappus macronema Gray.)

2. **M. súffruticòsa** Nutt. Bushy undershrubs 4 to 12 in. high; stems reddish brown; herbage puberulent with gland-tipped hairs; leaves oblanceolate to linear, entire, green, ½ to 1 in. long; heads solitary at the ends of the branchlets or sometimes a little clustered; involucres broadly turbinate, 4 to 6 lines high, the bracts lanceolate or linear, the outer foliaceous, the inner scarious margined, often purplish; rays few, 3 to 5 lines long.—High montane peaks, 8000 to 12,000 ft.: Sierra Nevada from Mt. Guyot and Mt. Goddard to Pyramid Peak and Castle Peak; e. to Ariz., n. to Mont. July-Sept. (Aplopappus suffruticosus Gray.)

3. **M. grèenei** (Gray) Greene. Stems from a shrubby base, 8 to 12 in. high; herbage glabrous or above viscid-puberulent; leaves spatulate-oblong or oblanceolate, ½ to 1¼ in. long; heads in crowded clusters on the ends of the branchlets, rarely solitary; involucres turbinate, 4½ to 5½ lines high; bracts in about 3 series, lanceolate to linear, all but the innermost with foliaceous tips; rays broad, 3 to 4 lines long.—Montane, 5000 to 6200 ft.: Yollo Bolly Mts. to Scott Mts.; Modoc Co.; n. to Wash. Sept. Var. MÓLLIS Jepson n. comb. Herbage puberulent to white-tomentose, especially above.—Warner Mts., Modoc Co.; n. to Ore. (Aplopappus mollis Gray.)

45. **CHRYSOTHÁMNUS** Nutt.

Shrubs or suffrutescent plants. Leaves narrow, entire. Herbage tomentose to glabrous, sometimes viscidulous or resinous. Inflorescence paniculate or cymose, rarely racemose or with solitary heads. Heads narrowly turbinate, discoid, rarely radiate, 5 to 30-flowered. Involucral bracts well imbricated,

commonly in more or less distinct vertical ranks, chartaceous or coriaceous, with or without herbaceous tips. Style-branches subulate or filiform, usually well-exserted. Achenes narrow, terete or slightly angled, pubescent. Pappus-bristles copious, soft, dull white to yellowish or brownish. (Greek chrysos, gold, and thamnos, bush or shrub.)

Heads discoid.
- Branches glabrous or puberulent, pubescence not felt-like ..... 1. *C. viscidiflorus.*
- Branches with felt-like tomentum, thin and close, or thicker and looser.
  - Outer involucral bracts obtuse to moderately acuminate; inflorescence cymose ... 2. *C. nauseosus.*
  - Outer involucral bracts with long attenuate tips; inflorescence racemose, spicate or paniculate ..... 3. *C. parryi.*

Heads radiate, the rays 2 to 4; herbage glabrous ..... 4. *C. bloomeri.*

1. **C. viscidiflòrus** Nutt. Shrub 1 to 8 ft. high; younger stems glabrous or sometimes puberulent, commonly white; leaves linear, acute, apiculate, mostly 3-nerved, glabrous or puberulent, evidently or obscurely scabrous-ciliate, 1 to 2 in. long; heads in a dense cymose cluster; involucres 3 to 3½ lines high, the bracts mostly obtuse, in about 3 series, only the small basal ones foliaceous or foliaceous-tipped.—Dry slopes and benches, 3400 to 8600 ft.: n. and e. sides of the Sierra Nevada from Siskiyou Co. to Inyo Co.; s. to L. Cal., n. to Mont., e. to Ariz. The species and varieties are distinguished as follows:

Plants mostly 1½ to 8 ft. high.
- Leaves 1 to 2 lines wide, 1 to 3-nerved ..... *C. viscidiflorus.*
- Leaves 2 to 4 lines wide, 3 to 5-nerved ..... var. *latifolius.*

Plants mostly 5 in. to 1½ ft. high.
- Herbage glabrous; leaves linear.
  - Leaves deep green ..... var. *pumilus.*
  - Leaves pale ..... var. *stenophyllus.*
- Herbage densely puberulent.
  - Leaves narrowly linear ..... var. *puberulus.*
  - Leaves linear to linear-oblanceolate ..... var. *humilis.*

Var. LATIFÒLIUS Greene. One to 3½ ft. high; leaves 2 to 4 lines wide, oblanceolate, obtuse, mucronate, 3 to 5-nerved.—Modoc Co. Var. PÙMILUS Jepson n. comb. Five to 15 in. high; leaves linear, bright green, glabrous except the scabrous to hispidulose margins.—Eastern Sierra Nevada and S. Cal., 6000 to 8000 ft. (C. pumilis Nutt.) Var. STENOPHÝLLUS Hall. Leaves paler, somewhat rigid, margins hispidulose.—Bear Valley, San Bernardino Mts.; e. to N. Mex. Var. PUBÉRULUS Jepson n. comb. Erect, ½ to 1 ft. high, the branches short, fastigiate, leafy; foliage and twigs scabro-puberulent to hispidulous; leaves spatulate-linear to linear, 1-nerved, ¼ to 1 in long; heads in small clusters at the ends of the branchlets; involucres barely 3 lines high, their bracts obtusish, mucronulate.—Dry sandy situations, 5000 to 6000 ft.: Mono Co.; n. to B. C., e. to Col. (C. puberulus Greene.) Var. HÙMILIS Jepson n. comb. Plants depressed, much-branched from base, forming broad compact tufts 6 to 8 in. high; herbage finely puberulent; leaves linear or narrowly oblanceolate, apiculate, 5 to 10 lines long; heads 6-flowered, disposed in compact cymose clusters at the ends of the stems; involucres 4 lines high, viscid, the bracts in about 3 series, the lower lanceolate, foliaceous, the others oblong, obtuse, scarious-margined.—Arid valleys: e. Nevada Co.; e. to Nev., thence n. to Ore. (C. humilis Greene.)

2. **C. nauseòsus** (Pall.) Britt. Shrub 1 to 5 ft. high, of the Great Basin region, represented in Cal. by the following varieties:

Plants green, the felted tomentum close, inconspicuous.
- Involucral bracts with slender recurved tips ..... var. *ceruminosus.*
- Involucral bracts obtuse to acute.
  - Bracts strongly keeled in very distinct vertical rows ..... var. *mohavensis.*
  - Bracts moderately keeled ..... var. *consimilis.*

Plants gray or white, the felted tomentum apparent.
- Tomentum thick, loose.
  - Corolla commonly less than 3 lines long; style appendages ½ to ¾ line long .... var. *hololeucus.*
  - Corolla 4 to 5 lines long; style appendages 1 line long ..... var. *albicaulis.*
- Tomentum thin, compact.
  - Involucre 5½ to 6 lines high.
    - Bracts abrutly acute ..... var. *occidentalis.*
    - Bracts acuminate ..... var. *bernardinus.*
  - Involucre 3 to 4½ lines high.
    - Style appendages about 1 line long ..... var. *speciosus.*
    - Style appendages about ½ line long ..... var. *gnaphalodes.*

Var. CERÙMINÓSUS Hall. Rounded shrub 1¾ to 5 ft. high, fastigiately branched, the branches sparsely leafy; herbage covered with a compact yellowish green tomentum, scarcely odorous; leaves narrowly linear, 4 to 9 lines long; involucres puberulent, the bracts with slender recurved tips.—W. Mohave Desert and mts. bordering it on the west. Oct. (Linosyris ceruminosa D. & H.) Var. MOHAVÉNSIS Hall. Stems covered with a compact yellowish green tomentum, the leaves for the most part soon deciduous; leaves narrowly linear to filiform, puberulent to glabrate, ½ to 1 in. long; involucres glabrous, 4 to 4½ lines high, sharply 5-angled, the bracts strongly keeled, abruptly acute, in 4 or 5 series.—Colorado and Mohave deserts and bordering mts.; n. in the inner South Coast Ranges to Mt. Hamilton. July-Oct. (Bigelovia mohavensis Greene. B. leiospermus Gray in part.) Var. CONSÍMILIS Hall. Stems covered with a compact yellowish green tomentum; herbage fragrant; leaves very narrowly linear to filiform, nearly glabrous, ¾ to 2 in. long; inflorescence thyrsoid; involucres puberulent, 3 to 3½ lines high, the bracts obtuse or acute, in 3 series.—Alkaline flats, n. and e. sides of the Sierra Nevada: Siskiyou Co. to Modoc Co., thence s. to Mono Co.; n. to Ore. and Ida., e. to Col. and N. Mex. Sept.-Oct. (C. consimilis Greene.) Var. HOLOLÈUCUS Hall. Two to 6 ft. high, the entire plant white with a thick densely felted tomentum; leaves of the flowering stems commonly spreading or recurved, 4 to 10 lines long, 1 line or less wide; involucral bracts very obtuse; corolla commonly less than 3 lines long; style-appendages ½ to ¾ line long.—Gravelly slopes, desert region, e. side the Sierra Nevada, 4800 to 5700 ft.: Mono Co. to w. Mohave Desert; n. to Pyramid Lake, Nev. Oct.-Nov. (Bigelovia graveolens var. hololeuca Gray.) Var. ALBICAÙLIS Rydb. Similar in appearance to var. hololeucus; corolla longer (4 to 5 lines); style-appendages 1 line long.—Dry slopes, e. side the Sierra Nevada: Modoc Co. to Mono Co. (Bigelovia graveolens var. albicaulis Gray.) Var. OCCIDENTÀLIS Hall. Stems rather thinly grayish-tomentose; herbage fragrant; leaves narrowly linear, erect, tomentose to glabrate, ¾ to 2 in. long; involucral bracts ovate to ovate-lanceolate, acute or cuspidate, puberulent, in 3 or 4 series.—More or less rocky situations, 500 to 9000 ft.: inner North Coast Ranges; Sierra Nevada; San Bernardino Mts. Aug.-Oct. (C. occidentalis Greene.) Var. BERNARDÌNUS Hall. Stems thinly tomentose; leaves narrowly linear, erect, strict, tomentulose, ¾ to 1¼ in. long; involucres glabrous, 4 to 5 lines high, the bracts acuminate, in 3 to 4 series.—Mts. of S. Cal., 8000 ft.: San Gabriel, San Bernardino and San Jacinto mountains. Aug. Var. SPECIÒSUS Hall. Stems thickly leafy; herbage grayish-tomentose; leaves linear, mostly 1¼ to 2½ in. long; involucres 4 to 4½ lines high, puberulent, the bracts in 3 or 4 series.—Moderately alkaline slopes and benches, 3000 to 7900 ft.: n. and e. side of the Sierra Nevada from Siskiyou Co. to Mono Co. (C. speciosus Nutt.) Var. GNAPHALÒDES (Greene) Hall. Rounded shrub 1½ to 5 ft. high; heads in a rounded cyme; involucral bracts in 5 distinct vertical rows, tomentose; achenes densely pubescent.—Gravelly or sandy places in the deserts: Mohave Desert; Inyo and Mono Cos.; e. to Nev. (C. speciosus var. gnaphalodes Greene.)

3. **C. párryi** (Gray) Greene. Shrub 1 to 2 ft. high, of the Great Basin region, represented in Cal. by the following varieties:

Leaves less than 2 lines wide.
  Racemes with heads several to many.
    Plants more than 6 in. high.
      Involucral bracts 12 to 20 in rather obvious vertical rows...var. *nevadensis*.
      Involucral bracts 8 to 12, vertical rows obscure.....var. *vulcanicus*.
    Plants mostly less than 6 in. high.....var. *imulus*.
  Racemes reduced to 1 or 2 heads each; involucral bracts 8 to 12, vertical rows obscure .....var. *monocephalus*.
Leaves 2 to 5 lines wide.
  Leaves linear-oblanceolate, mostly 2 lines wide; flowers 8 to 11 in head.*var. bolanderi*.
  Leaves oblanceolate to elliptic, 2½ to 5 lines wide; flowers 5 to 7 in head...var. *latior*.

Var. NEVADÉNSIS Hall. Much branched, the branches strict, covered with grayish tomentum; leaves linear, mucronate, tomentose, ½ to 1 in. long; inflorescence paniculate, the heads 5-flowered, mostly clustered toward the ends of the branchlets; involucres tomentose, 7 lines high; bracts 12 to 20, lanceolate, in about 4 series, in rather obvious vertical rows, all except the

inner herbaceous-tipped.—Montane, 4500 to 9000 ft.: e. Sierra Nevada from Plumas Co. to Alpine Co.; e. to Nev. and Ariz. Aug.-Sept. (C. nevadensis Greene.) Var. VULCÁNICUS Jepson n. comb. Leaves commonly greener and more glandular; involucral bracts 8 to 12, not obviously in vertical rows.—Eastern and southern Sierra Nevada: Mono, Inyo and Tulare Cos.; thence w. to Alamo Mt., Ventura Co. (C. vulcanicus Greene. C. asper Greene.) Var. ÍMULUS Jepson n. comb. Stems spreading at base, less than 6 in. high, the branches erect, leafy, white-tomentose; leaves rigid, spatulate to linear-spatulate, minutely pungent, thinly tomentose, 4 to 8 lines long; involucres tomentose; corollas 4 lines long.—Bear Valley, San Bernardino Mts. (C. parryi subsp. imulus Hall.) Var. MONOCÉPHALUS Jepson n. comb. Much branched, 3 to 10 in. high, tomentose; leaves linear to spatulate-linear; heads usually solitary (or 2), sessile at the ends of the branchlets.—Sierra Nevada, 8000 to 9000 ft., Mono Co. Aug. (C. monocephalus Nels. & Ken.) Var. BOLÁNDERI Jepson n. comb. About 1 ft. high; leaves thinner, minutely glandular-puberulent, linear-oblanceolate, acute, mucronulate, 10 to 18 lines long; flowers 8 to 11 in a head.—East slopes or e. summits of the Sierra Nevada, 8000 to 10,000 ft.: Tuolumne and Mono Cos. to Tulare Co. (Bigelovia bolanderi Gray.) Var. LÀTIOR Hall. Leaves firm, minutely glandular, oblanceolate to elliptic, mucronulate, 2½ to 5 lines wide; flowers 5 to 7 in a head.—Siskiyou and Modoc Cos.

4. **C. bloómeri** (Gray) Greene. Low shrub 1 to 1½ ft. high, the main woody stems with numerous fastigiate branches; herbage glabrous; leaves linear, 1 to 2 in. long, carinately 1-nerved beneath, the upper side sometimes a little trough-shaped; heads in a rather dense raceme or narrow panicle; involucres oblong, 4½ lines high; bracts linear, acute, chartaceous, scarious-margined, villous-ciliate; rays 2 to 4, 3 to 5½ lines long; achenes sparsely pubescent.—Openly wooded slopes, 7000 to 9000 ft.: Sierra Nevada from Kern Co. to Modoc Co.; Mt. Shasta; n. to Wash., e. to Nev. Aug.-Sept. (Aplopappus bloomeri Gray.)

46. **SOLIDÀGO** L. GOLDEN ROD

Perennial herbs with alternate leaves. Heads small, the raceme-like clusters aggregated in a rounded pyramidal or spike-like panicle or thyrsus, or in one of our species the heads corymbose. Bracts of the involucre narrow, thin or chartaceous, imbricated in 2 or more series. Both ray- and disk-flowers yellow. Pappus a single series of scabrous and mostly equal capillary bristles, usually dull white. Achenes terete or angular, 5 to 10-nerved. (Latin solidus and ago, to unite firmly, certain species reputed to have wound-healing properties.)

Stem freely branching; rays commonly more numerous than the disk-flowers. . . . . 1. *S. occidentalis.*

Stems simple; rays commonly fewer or not more numerous than the disk-flowers.
  Leaves grayish with a minute rough pubescence, oblong to oblong-obovate. . . . . 2. *S. californica.*
  Leaves glabrous or sometimes puberulent (S. corymbosa sometimes pubescent).
    Heads 3 to 4 lines high.
      Leaves commonly serrate above the middle; heads in clusters in a single (more or less interrupted) spike-like thyrsus; coast species. . . . . 3. *S. spathulata.*
      Leaves commonly entire; montane species.
        Heads usually glomerate in a compact roundish or oblong cluster; herbage not resinous . . . . . 4. *S. corymbosa.*
        Heads in a flat-topped cymose cluster; herbage somewhat resinous. . . . . 5. *S. pumila.*
    Heads 1½ to 2 lines high.
      Leaves mostly entire; South Coast Ranges; coastal S. Cal.
        Heads many in a dense panicle. . . . . 6. *S. confinis.*
        Heads few in a narrow thyrsus. . . . . 7. *S. guiradonis.*
      Leaves mostly serrate; Sierra Nevada and North Coast Ranges. . . . . 8. *S. elongata.*

1. **S. occidentàlis** Nutt. WESTERN GOLDEN ROD. Fig. 929. Stem simple, erect, 3 to 5 ft. high, very leafy, freely and paniculately branching above, the branches terminated by more or less distinctly corymbose clusters of small heads; herbage glabrous; leaves linear or nearly so, entire, sprinkled

929. Solidago occidentalis Nutt.; *a*, fl. branchlet x ½ ; *b*, leaf x ½ ; *c*, head x 2 ; *d*, ray-fl. x 4; *e*, achene and pappus x 4.

with minute clear or dark dots, 1 to 4 in. long; heads 2 to 2½ lines high; bracts of involucre chartaceous, linear-lanceolate; rays 16 to 20; disk-flowers 8 to 14; achenes turbinate.—Marshes, stream beds and river banks, 10 to 2000 ft.: throughout cismontane Cal.; n. to B. C., e. to Rocky Mts. Aug.-Oct.

2. **S. californica** Nutt. COMMON GOLDEN ROD. Fig. 930. Stem erect, simple, rather densely leafy, 2 to 4 ft. high, ending above in a terminal panicle; herbage grayish with a minute rough pubescence; leaves oblong to oblong-obovate, serrate or entire, acute, attenuate below, 1 to 4½ in. long, the upper smaller, narrow and entire; panicle usually compact, dense, not leafy, 4 to 13 in. long, made up of raceme-like clusters (or when elongated, secund), seldom recurved at tip, sometimes spreading in age; heads 2 to 3½ lines high; bracts of the involucre oblong-linear or lanceolate, somewhat pubescent; rays 7 to 12, pale yellow, about as many as the disk-flowers; achenes pubescent. — Dry plains or hillslopes, 100 to 4000 (or 6000) ft.: throughout cismontane Cal. Sept.-Nov. Orojo de Liebre of the Spanish-Californians. Var. NEVADÉNSIS Gray. Thyrsus and its clusters more secund; heads rather smaller; involucres mostly glabrous.—Dry situations, 2000 to 5300 ft.: Sierra Nevada from Plumas Co. to Fresno and Inyo Cos.; e. to Nev.

3. **S. spathulàta** DC. COAST GOLDEN ROD. Stems simple, 15 to 18 in. high, one or several from the decumbent base which is thickly clothed with broad leaf-bases; herbage glabrous, slightly glutinous; leaves mostly basal, the basal spatulate or obovate, more or less serrate above the middle, narrowed below to a margined petiole, the whole 1 to 2 in. long; cauline leaves scattered, rather smaller; heads 3 to 4 lines high, in clusters of 4 to 12, the clusters borne in a single spike-like thyrsus terminating the stem; bracts of the involucre linear-oblong to oblong; rays 5 to 10, inconspicuous, commonly shorter than the disk; disk-flowers 8 to 20.—Sandy hills along the coast: Pt. Reyes to Monterey.

4. **S. corymbòsa** Nutt. Stems simple, leafy, ¼ to 1½ ft. high, few or several from a branching rootstock, the leaves chiefly basal, the cauline few and smaller; herbage glabrous or puberulent; leaves oblong-spatulate to oblanceolate, entire or sometimes serrate, 1 to 3½ in. long, narrowed to a petiole ½ to as long; heads 3 lines high, relatively few in a single roundish terminal cluster or sometimes 1 or 2

930. Solidago californica Nutt.; *a*, fl. branchlet x ½ ; *b*, leaf x ½ ; *c*, ray-fl. x 6.

loose axillary clusters; ray-flowers 9 to 16; disk-flowers 13 to 45.—High montane, 8500 to 12,000 ft.: Sierra Nevada; e. to the Rocky Mts. July-Aug. (S. multiradiata var. scopulorum Gray.)

5. **S. pùmila** T. & G. Stems erect, usually many from a branched woody root-crown, simple, 5 to 8 in. high, leafy but the leaves chiefly basal; herbage glabrous, somewhat resinous; basal leaves oblanceolate to linear-oblanceolate, acute, rigid, 3-nerved, attenuate below to a petiole, the whole 1 to 4 in. long; cauline leaves narrow, sessile, ¾ to 2 in. long; heads 3 to 4 lines high, borne in a flattish-topped cymose cluster; involucral bracts rigid, somewhat carinate, imbricated in several series; achenes 5-nerved, broad and flattish, rather longer than the rigid pappus.—Rocky ridges, 3500 to 9000 ft.: Providence Mts.; e. to Tex., n. to Ida. July.

6. **S. confinis** Gray. Stem 1½ to 4 ft. high, simple and leafy up to the terminal panicle; herbage pale green, glabrous or rarely minutely pubescent above; leaves narrowly lanceolate, acuminate, entire or sometimes serrate, narrowed to the sessile base, 2 to 6 in. long, the basal petioled; panicle dense, oblong, or sometimes more compound and pyramidal, the heads 2 lines high; rays scarcely surpassing the disk; achenes minutely to canescently pubescent.—Moist places, 1000 to 6000 ft.: South Coast Ranges; coastal S. Cal.; s. to L. Cal. July-Nov. Var. LUXÙRIANS Jepson n. comb. More robust and the herbage succulent; leaves thickish, broadly lanceolate or oblong; inflorescence oblong or pyramidal; heads larger.—Swampy ground, often in alkaline soil in the vicinity of hot springs: San Bernardino Mts.; Ventura Co. (f. luxurians Hall.)

7. **S. guiradònis** Gray. Stem slender, simple, 2½ ft. high, bearing rather few heads in a simple virgate thyrsus; leaves linear-lanceolate, acuminate, entire, attenuate toward base, thickish, 3 to 7 in. long; heads 1 to 1½ lines high; involucral bracts lanceolate or linear, acutish; rays 8 to 15, small; achenes pubescent.—Stream banks, San Carlos Range. Aug.

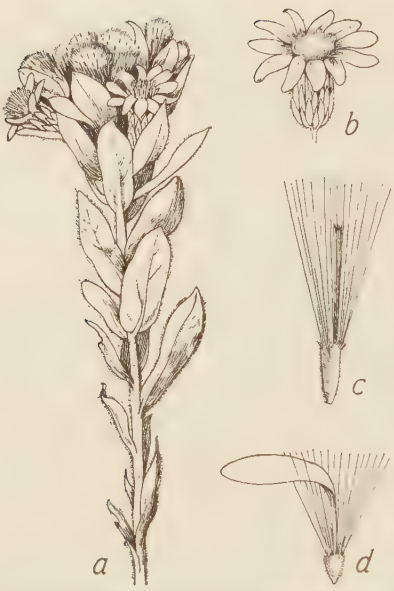
8. **S. elongàta** Nutt. Stem simple, erect, leafy, puberulent, 3 ft. high, ending above in a thyrse-like panicle; leaves oblong to broadly oblanceolate or linear-oblanceolate, acute, attenuate below to a narrow winged base, sharply serrate, except at base, or entire, 2 to 3¾ in. long, almost or quite glabrous, scabrous-margined, often bright green; panicle dense, thyrse-like, the heads little if at all secund in the raceme-like clusters; heads small, 1½ to 2¼ lines high or less; bracts of the involucre thin, linear; rays 10 to 16, narrow, usually more numerous than the disk-flowers.—Along the coast, 100 to 3000 ft., from San Mateo Co. to Humboldt and Siskiyou Cos.; Sierra Nevada, 3000 to 6600 ft., from Tulare Co. to e. Siskiyou Co.; n. to B. C. and Mont. July-Aug.

47. CHRYSÓPSIS Ell.

Perennial herbs, sometimes suffrutescent, with entire leaves. Heads medium-sized, solitary or paniculate. Rays present or none. Involucre campanulate to hemispherical, its bracts narrow and regularly imbricated. Flowers yellow. Style-appendages linear-filiform to subulate. Achenes compressed or turgid. Pappus brownish or ferruginous, of numerous capillary bristles, with or without a short outer row of little scales. (Greek chrusos, golden, and opsis, aspect, from the color of the blossom.)

Heads with rays; outer pappus linear-squamellate ..... 1. *C. villosa.*
Heads rayless; corolla sparingly hirsute; outer pappus none or indistinct.
  Herbage hirsute with spreading white hairs; involucral bracts linear-lanceolate, in 3 or 4 series, the longer often equaling the (3 to 3½ lines long) pappus ..... 2. *C. oregana.*
  Herbage somewhat puberulent; involucral bracts broader, in 2 series (except in var. multibracteata), the longer little exceeding the achenes, the pappus exceeding the bracts by 2½ to 3 lines.
    Leaves distinctly apiculate or mucronate; achenes villous, not glandular ..... 3. *C. breweri.*
    Leaves merely acute; achenes with rather long gland-tipped hairs. 4. *C. shastensis.*

1. **C. villòsa** Nutt. Stems leafy, branched, several to many from a woody perennial base, 5 to 11 in. high; herbage grayish with strigose or hirsute pubescence; leaves oblong-spatulate, entire, ½ to 1½ in. long; heads rather



931. Chrysopsis villosa var. bolanderi Gray; *a*, fl. stem x ½; *b*, head x 1; *c*, disk-fl. x 2; *d*, ray-fl. x 2.

few, solitary or clustered at the ends of leafy branchlets, naked or with a few small foliaceous bracts; involucres campanulate, 3½ to 4 lines high, their bracts oblong to lanceolate; rays yellow; achenes villous, the outer pappus of narrow scales.—Montane, 3600 to 5800 ft.: Placer Co. to Modoc Co.; n. to B. C., e. to Minn. and Tex. June. Var. BOLÁNDERI Gray. Fig. 931. Stems low, 3 to 12 in. high, rather stout, several from the woody base; herbage villous-pubescent and often scabrous, greenish or sometimes silky; leaves oblong-spatulate, mucronate, narrowed below to a distinct petiole or the upper sessile and less spatulate, or widest at the middle and tapering to both ends, mostly 1 in. long; heads 5 to 7 lines high, leafy-bracted, solitary or few in a corymbose cluster; involucres campanulate or cylindric-campanulate, their bracts lanceolate or subulate, villous-pubescent, in a few ranks; rays 4 to 6 lines long; pappus-bristles minutely scabrous, in a single row; outer pappus of little scales; achene silky, ¾ line long.—Dry hillsides or rocky hilltops near the coast: San Bruno Hills; San Francisco; Berkeley Hills and northward to the ocean bluffs of Mendocino Co., where it occurs in typical form. June-Sept. Var. ECHIOÏDES Gray. Stems rigid, erect, 10 to 16 in. or even 2½ ft. high, usually suffrutescent at base; herbage densely hirsute-canescent; leaves rigidulous, ½ in. long, the lowermost longer; involucral bracts hispid-pubescent, the foliose bracts often hispid-ciliolate; pappus-bristles in a single row; outer pappus consisting of very short little scales, not concealed by the pubescence of the achene.—Dry ground: Vaca Mts. and s. through the San Joaquin Valley and South Coast Ranges to San Diego Co. Var. SESSILIFLÒRA Gray. Stems few or several from a woody root-crown, 1½ to 2 ft. high, freely branching above, the heads 4 to 5 lines high and solitary, or 2 or 3 together at the ends of long branchlets; herbage hispid or villous-canescent or greenish, somewhat viscid; bracts sparsely hirsute, granulose-glandular; rays 3 to 4 lines long; corolla-tube 4-angled toward the base; slender little scales of the outer pappus often concealed by the densely villous hairs clothing the achene.—Santa Cruz Mts. and s. to coastal S. Cal. Var. FASTÍGIÀTA Hall. Stems densely leafy above the base, leaves elliptic to oblong-ovate, obtuse or acute, mucronate, silky-tomentose, especially beneath, sessile, 5 to 11 lines long; outer pappus sometimes present as short bristles.—Rocky washes or dry slopes, San Gabriel Mts.; also in the Sierra Nevada in Fresno Co. (C. fastigiata Greene.) Var. CAMPHORÀTA Jepson n. comb. Stems many from a woody root-crown, 1 to 3 ft. high; herbage densely glandular, somewhat hirsute; leaves oblong-lanceolate; heads rather few, cymose-paniculate; foliaceous bracts usually several, small; involucres turbinate to campanulate; achenes villous, the outer pappus of narrow scales.—Santa Cruz Mts. July. (C. camphorata Eastw.)

2. **C. oregàna** Gray. Stems several from the base, very freely and often densely branched, the branchlets often long, forming a low bush 1½ to 2 ft. high; herbage hirsute with spreading white hairs but the aspect green; leaves oblong to lanceolate, ascending, ½ to 1¾ in. long, those of the branchlets 3 to 6 lines long; heads few or numerous, naked, the peduncles with 1 or 2 subulate bracts; bracts linear-lanceolate, in several series; corolla very

slender, sparingly hirsute about the middle or on the lobes only; outer pappus none; achenes oblong.—Gravelly beds of streams in the Coast Ranges, 100 to 1200 ft.: Santa Clara Co. to Lake Co.; n. to Ore. Aug.-Sept. Var. RÙDIS Jepson. Stems 8 to 24 in. high, arising from a stolon-like rootstock, simple below and bearing above a subcorymbose or paniculate cluster of heads; herbage hispid-pubescent, but not hoary, glandular; leaves narrowly oblong, varying to lanceolate, acute or acuminate, cuspidate, the lower more often widest above the middle, ¾ in. long; involucre nearly or quite equaling the flowers, its bracts scarious-margined, 1-nerved.—Sandstone stream beds: Napa Valley. Sept.-Oct. Var. SCABÉRRIMA Gray. Leaves small, these and the branches very hispid-scabrous.—Monterey Co.; Tulare Co. June.

3. **C. brèweri** Gray. Stems erect from a hard root-crown, slender, very leafy, corymbosely branched above with erect or suberect branches, 1½ to 2½ ft. high; herbage puberulent, commonly a little glandular; leaves oblong to ovate-lanceolate, apiculate, sessile, ½ to 1½ in. long; heads broadly turbinate, on naked or leafy-bracteate peduncles at the ends of the branchlets; involucres 3 to 4 lines long; involucral bracts few, rather broadly lanceolate, in 2 series, little exceeding the achenes; rays none; flowers yellow; achenes strigose-pubescent; pappus much exceeding the involucre, the outer pappus setulose.—Montane, 5000 to 9500 ft.: Sierra Nevada from Tulare Co. to Nevada Co. July-Aug. Var. MULTIBRÁCTEÀTA Jepson n. var. Bracts narrowly ovate to oblong-lanceolate, sometimes contracted above the middle, about 3-ranked.—Siskiyou Co. (Sisson, J. W. Congdon, type). Aug.

4. **C. shastènsis** Jepson n. sp. Stems freely branched, leafy, about 1 ft. high; stems, branches and peduncles pilose with spreading gland-tipped hairs; leaves ovate, sessile, 7 to 13 lines long, subacute; heads terminating the branchlets and thus corymbosely arranged, the peduncles ¾ to 2 in. long, mostly naked; involucres 4 lines high, their bracts oblong-oblanceolate, acute, somewhat chartaceous, pubescent with gland-tipped hairs; rays none; flowers apparently reddish brown; achenes striately angled, pubescent with ascending gland-tipped hairs; pappus much exceeding the involucres in mature heads.—Mt. Shasta (Horse Camp, 8000 ft., Jepson 51i, type).

C. WRÌGHTII Gray. Herbage pubescent with fine soft hairs; involucral bracts all partly herbaceous, the inner ones nearly equaling the flowers; rays lacking; corolla-limb slightly hairy outside; outer pappus obscure; inner pappus extremely copious (ex char.).—San Bernardino Mts. (acc. Gray), but not recollected.

48. HÉTEROTHÈCA Cass.

Tall hairy herbs with heads of yellow flowers in a terminal corymbose panicle. Involucre broadly oblong (or ovate in fruit), its narrow bracts closely imbricated in many series, without spreading tips. Both ray- and disk-flowers numerous and fertile. Ray-achenes triangular, with broad sides and narrow back; pappus none or caducous. Disk-achenes compressed, silky-hirsute; pappus double, the copious inner bristles long, capillary and scabrous, the outer of short and stout bristles or scales or inconspicuous. (Greek heteros, different, and theke, a case or ovary, the achenes of disk and ray dissimilar.)

932. Heterotheca grandiflora Nutt.; *a*, leaves x ⅓; *b*, fl. branchlet x ½; *c*, disk-achene and pappus x 2½; *d*, ray-achene x 2½.

1. **H. grandiflòra** Nutt. Fig. 932. Stem mostly simple below, 2 to 5 ft. high, ending above in a panicle; peduncles with gland-tipped hairs; leaves ovate, varying to elliptic or oblong, serrate, 1 to 3 in. long, the lower and basal long-petioled, the upper sessile by a rather broad base; heads rather large (4 or 5 lines high); rays about 30; pappus of disk-flowers as long as or longer than the achene, in age brick-red; outer pappus inconspicuous.—Sandy valleys, 20 to 1200 ft.: coastal S. Cal.; n. to the San Joaquin and Santa Clara valleys. May-Oct.

49. **CONÝZA** Less.

Ours herbs with rather small heads borne in cymes, racemes or panicles. Heads composed of numerous pistillate flowers and a few central perfect flowers. Bracts of the involucre in 2 or 3 series, linear, membranous-margined in ours. Flowers dull white or yellowish. Pistillate flowers fertile, in 2 or 3 outer circles; corollas filiform and merely 2 to 4-notched at apex or truncate, much shorter than the style. Perfect flowers few, central, mostly fertile; corolla tubular-funnelform, 5-lobed, little shorter than the style. Rays none. Achenes small, compressed. Pappus commonly a single series of a few capillary bristles. (Greek name for fleabane, supposedly from konops, a flea.)

1. **C. còulteri** Gray. Annual; stem erect, simple below, paniculately branched above, 1 to 3 ft. high; herbage hirsute and glandular-puberulent; leaves narrowly obovate to oblong or oblong-oblanceolate, unequal and often coarsely serrate or pinnatifid, sessile or somewhat clasping, $\frac{1}{2}$ to $2\frac{1}{4}$ in. long; panicle ample, 8 to 24 in. long; heads 2 lines high, the involucre shorter than the soft pappus; corolla of pistillate flowers with entire apex, about $\frac{1}{2}$ as long as the style; perfect flowers 5 to 7.—Moist valley flats, commonly in alkaline soil, 190 to 1200 ft.: coastal S. Cal.; Colorado Desert; Kern Lake, upper San Joaquin Valley; Santa Clara Valley; Santa Rosa; lower San Joaquin River; Ione; Nev. to Col. and Mex. Sept.

50. **PENTACHAÈTA** Nutt.

Low and very slender annuals with narrowly linear entire leaves. Heads small, solitary, or somewhat clustered at the ends of more or less naked branches, nodding in the bud. Receptacle convex. Involucre turbinate-campanulate, its bracts in 2 series, narrowly oblong, thin, scarious-margined, mucronulate, appressed. Disk-corollas yellow or rose-red, very slender; rays white, pink or yellow, or none. Achenes oblong, flattened, hirsute-pubescent. Pappus of 5 slender bristles, often with 2 reduced or wanting, or all obsolete. (Greek pente, five, and chaite, a bristle, in allusion to the pappus.)

Flowers of the ray white or purple-tinged or wanting; disk corollas yellow or reddish, or changing to purple in age.
- Disk-corollas yellow; herbage glabrous; stem simple or with 1 or 2 branches near the base ..... 1. *P. bellidiflora.*
- Disk-corollas rose-red or reddish; herbage more or less pubescent.
  - Disk-corollas urnshaped-campanulate; stem simple or with simple branches from the base, erect; peduncles white-villous beneath the head.... 2. *P. exilis.*
  - Corollas all filiform, truncate or merely toothed at apex; stem dichotomous, and disposed to be diffuse; peduncles with somewhat scattered hairs..... 3. *P. alsinoides.*

Flowers of both ray and disk golden yellow (rays occasionally yellow only at base in P. aurea); heads 4 to 12 lines broad.
- Involucre glabrous.
  - Bracts of involucre very unequal; leaves narrowly linear to filiform... 4. *P. aurea.*
  - Bracts of involucre equal; leaves oblong to spatulate..... 5. *P. fragilis.*
- Involucre pubescent ..... 6. *P. lyonii.*

1. **P. bellidiflòra** Greene. Stems simple or sparsely branched near the base, reddish, 3 to 4 in. high; herbage glabrous; heads 4 to 7 lines broad, solitary, terminating the stems or branches; involucres broadly campanulate, 2 to $2\frac{1}{2}$ lines high; bracts oblong, acute or mucronate, purplish, equal; rays 2 to 14, white, 1 to 2 lines long; pappus bristles 5.—Marin Co. Apr.

2. **P. exilis** Gray. Fig. 933. Stem simple or branched from the base with erect branches, $2\frac{1}{2}$ to 4 in. high, the heads solitary on the end of the stem or branches; herbage purplish; leaves filiform or nearly so, 3 to 12 lines long;

involucres narrowly campanulate, 2 lines high; disk-corollas rose-red, widening upward, the throat evidently contracted beneath the minute teeth, the 3 to 5 outer or ray-flowers with the corolla reduced to a filiform tube, the tube truncate or merely toothed at apex; achenes oblong-turbinate, villous; pappus reduced to 3 or 5 short cusps or sometimes abortive.—Hillslopes or valley flats, 100 to 1500 ft.: Salinas Valley to Eldorado Co. Apr.-May. (Aphantochaeta exilis Gray.) Var. GRAYI Jepson n. comb. Heads broadly campanulate; rays 8 to 14, 2 lines long; pappus-bristles 3 to 5.—Dry hills, Santa Clara Co. to Sonoma Co. (P. exilis Gray, Syn. Fl.)

3. **P. alsinoides** Greene. Stems diffusely and somewhat dichotomously branching, 2 to 5 in. high; leaves narrowly linear, 4 to 11 lines long; involucres narrowly turbinate, 1 to 1¼ lines high, containing 3 to 7 flowers; involucral bracts 5 to 7 or 9; disk-corollas filiform, with minute teeth; rays none; achenes obovate-clavate; pappus-bristles 3, very slender.—Foothills, 50 to 1000 ft.: San Luis Obispo Co. to Humboldt Co.; Eldorado Co. Apr.-May.

933. Pentachaeta exilis Gray; *a*, habit x ⅔; *b*, bract of involucre x 4; *c*, fl. x 4.

4. **P. aurea** Nutt. Stem very diffusely branched or nearly simple, 3 to 12 in. high; herbage glabrous or minutely and sparsely pubescent; leaves filiform to narrowly linear, ⅛ to 1¼ in. long; heads 7 to 11 lines broad; involucres nearly hemispheric, 2¼ to 3 lines high; involucral bracts imbricated, broadly linear or lanceolate, acute or acuminate, with scarious margins; rays golden yellow, conspicuous, 2 to 3 lines long; disk-corollas slightly irregular; pappus-bristles 5 to 8.—Hills and valley flats, 200 to 5000 ft.: San Luis Obispo Co. to San Diego Co.; e. to west side Colorado Desert. Apr.-July.

5. **P. frágilis** Bdg. Stems wiry, diffusely branched from the base, 2 to 4 in. high; leaves oblong to spatulate, ciliate, 1 to 3 lines long; heads 4 to 5 lines broad, solitary at the ends of the branches; involucres broadly campanulate, 2 lines high; involucral bracts oblong, equal, scarious-margined, ciliate and somewhat fringed at tip; ray-flowers yellow; pappus-bristles 7 to 12, scabrous, very fragile.—Montane, 2500 to 4000 ft., Sierra Nevada in Kern Co. June.

6. **P. lyonii** Gray. Stem erect, simple below or branched throughout, ½ to 1½ ft. high; herbage lightly pubescent to glabrate; leaves narrowly linear, ½ to 2 in. long; heads solitary on the ends of the corymbose branches, 6 to 8 lines broad; involucre 1¾ to 2¼ lines high, hirsute; involucral bracts linear, acute to subulate-acuminate, with scarious margins; flowers golden-yellow; pappus-bristles 8 to 12, somewhat dilated at base.—S. Cal. coast line: San Diego; Wilmington; Santa Catalina Isl.

51. **BÉLLIS** L. Daisy

Low herbs with (in ours) basal leaves and solitary heads on scape-like peduncles. Disk yellow. Rays white, or tinged with pink. Involucre hemispherical, its bracts wholly herbaceous and green, equal, in 2 rows. Receptacle conical. Achenes flattened, without pappus. (Latin bellus, pretty.)

1. **B. perénnis** L. Garden Daisy. Tufted perennial; scapes 3 to 6 in. high; leaves obovate, sparingly toothed, narrowed at base to a margined petiole, 1 to 1¾ in. long; peduncle about 4 in. high; rays about 50.—Native of Eur., an occasional escape from gardens: Berkeley; Mill Valley; established about Humboldt Bay and Trinidad.

52. **LESSÍNGIA** Cham.

Annuals with branching stems and commonly panicled heads. Heads rather small, campanulate to turbinate, usually narrow, 5 to 35-flowered. Bracts of the involucre imbricated in several appressed ranks. Receptacle flat. Flowers yellow, purplish, pink or white, perfect. Corollas with linear lobes, or those of the marginal rows enlarged, more deeply cleft on the inside, and simulating a palmately lobed ligule. Achenes all fertile, turbinate or cuneate, more or less flattened, silky-villous. Pappus commonly of numerous unequal scabrous bristles, usually turning reddish brown. (Named for the Lessings, German family of scientists and authors.)

Style-branches long-subulate, the hairs distributed all along the appendages.
- Flowers yellow; plants spreading, much branched; upper leaves and involucral bracts margined with large yellowish glands ..... 1. *L. lemmoni.*
- Flowers pale blue or purplish; plants less branched, rather fastigiate; upper leaves and involucral bracts scarcely glandular-puberulent ..... 2. *L. fastigiata.*

Style-branches blunt, the hairs crowded in penicillate tufts at the ends with a slender setiform appendage sometimes protruding.
- Distinct tack-like glands none.
  - Plants with stems erect or none; apparently not glandular.
    - Stems slender, ½ to 2 ft. high; branches rigid, rather fastigiate.
      - Inflorescence paniculate ..... 3. *L. leptoclada.*
      - Inflorescence virgate ..... 4. *L. virgata.*
    - Stout depressed dwarfs, ½ to 2 in. high ..... 5. *L. nana.*
  - Plants with stems spreading or ascending; bracts and branchlets somewhat glandular-puberulent beneath tomentum.
    - Tomentum becoming for most part deciduous ..... 6. *L. germanorum.*
    - Tomentum persistent or partially deciduous on involucral bracts ..... 7. *L. tenuis.*
- Distinct tack-like glands on leaf and bract margins.
  - Outer corollas exceeding inner, irregularly cleft ..... 8. *L. glandulifera.*
  - Corollas equal, all nearly regular ..... 9. *L. ramulosa.*

1. **L. lémmoni** Gray. Stem diffusely branched from base, 3 to 8 in. high; herbage persistently tomentose, the bracts and upper leaves bearing yellowish glands on the margins; leaves oblong to linear, entire, ¼ to ¾ in. long; heads terminating the branchlets; involucres turbinate, the bracts oblong, obtuse; flowers yellow, the outer larger than the inner; style-branches long-subulate; achenes white-villous, the pappus brownish.—Desert flats, 2000 to 4000 ft.: Mt. Pinos; Mohave Desert (Bissel sta., Kramer sta., Indian Wells); Inyo Co. (Little Owens Lake, Bishop); e. to Ariz. June.

2. **L. fastigiàta** Greene. Stems 1 to several, rather slender, strict, mainly erect, somewhat fastigiately branched at or above the middle, 3 to 10 in. high; herbage tomentose below, becoming more or less deciduous above and scarcely glandular-puberulent; leaves oblanceolate to oblong, pungently acute, entire or somewhat serrate, 4 to 14 lines long; heads solitary, or 2 or 3, at the ends of the rigidly filiform branchlets.—Grassy flats, 2000 to 4000 ft.: Humboldt Co. to Siskiyou Co., thence se. to Butte Co.

3. **L. leptóclada** Gray. Stem simple below, branching above, ½ to 2 ft. high; herbage tomentose or becoming partially glabrate; lower leaves denticulate, those of the branchlets ovate or lanceolate, acute, sometimes mucronate, with somewhat sagittately adnate base; branchlets virgate and almost filiform, bearing few (sometimes glomerate) or solitary heads; involucres turbinate; bracts in many ranks, persistently tomentose, greenish at tip and cuspidate; corollas conspicuously exserted; style-branches bluntly penicillate, only the tips barely exserted at anthesis; pappus-awns paleaceous or more or less united into groups at base.—Open slopes and grassy flats, 1100 to 5000 ft.: Sierra Nevada from Eldorado Co. to Tulare Co.; Coast Ranges from Marin Co. to Santa Clara Co. Var. HOLOLEÙCA Jepson n. comb. Inner involucral bracts not cuspidate or less evidently so; cauline leaves mainly ovate, more uniformly mucronate than in species.—Pastures, San Mateo Co. to Sonoma and Yolo Cos. (L. hololeuca Greene.)

4. **L. virgàta** Gray. Plant 1 ft. high, with stem and virgate branches rigid; herbage woolly, becoming somewhat glabrate; leaves ovate or oblong, sessile, entire, ¼ to ½ in. long, the upper appressed, concave, carinately nerved; heads solitary and sessile in the axil of a leaf of nearly the same length, thus forming a somewhat spicate inflorescence; involucres cylin-

drical, woolly, 5 to 7-flowered.—Plains and bordering foothills of the Great Valley. June-Sept.

5. **L. nána** Gray. Depressed dwarf ½ to 2¼ in. high, the whole plant densely tomentose with thick wool; stems 1 or several from the base, the heads borne at the ground or in small terminal clusters; heads 10 to 12-flowered, 5 to 6 lines long, leafy-bracted; leaves oblanceolate to linear, ½ to 1½ in. long; outer bracts of involucre linear-lanceolate, somewhat herbaceous; inner bracts white, tapering into a long pearly white awn which conspicuously equals or exceeds the flowers and the pappus; pappus showy, dark red or brownish; achenes very short and turgid.—Sandy plains and foothills on the eastern side of the Sacramento and San Joaquin valleys, 200 to 1000 ft., from Amador Co. to Kern Co. July-Aug. (L. parryi Greene.)

6. **L. germanòrum** Cham. Stem diffusely branched or erect, ⅓ to 1½ ft. high; herbage with appressed white tomentum, mainly deciduous in age, at least on the branches, the exposed surface puberulent, only slightly glandular; leaves pinnatifid, those of the branchlets oblanceolate or linear, mostly entire, 1 to 4 lines long; heads 21 to 25-flowered; involucres hemispherical; involucral bracts with greenish tips or the outer ones wholly greenish; pappus-bristles about 35, 1 to 1½ times as long as the achene.—Sandy hills along the coast: San Francisco to San Luis Obispo Co. Aug.-Oct.

7. **L. ténuis** Cov. Stems somewhat flexuous and diffuse, flowering when simple or little branched and 1 to 3 in. high, or increasing to 8 in. high and becoming much branched and spreading; herbage mainly tomentose, the partially exposed branchlets and involucres glandular-puberulent; leaves oblong or spatulate, entire or the lower sometimes pinnately lobed or parted; corollas variable, purple or yellow, or the inner yellow and outer pink, subregular; pappus-bristles about 20.—Montane, 2500 to 5300 ft.: San Benito Co. to n. Ventura Co. June. (L. ramulosa var. tenuis Gray.) Var. JARÉDII Jepson n. var. Stems a little stouter; leaves more uniformly pinnately toothed to parted; corollas yellow, the marginal ones the larger; pappus of 5 to 8 paleaceous awns.—San Luis Obispo Co. (Estrella, L. Jared, type). June. (L. parvula Greene in part.)

8. **L. glandulífera** Gray. Stem erect, stoutish, paniculately very much branched, 1 to 2¾ ft. high; herbage glabrate or the leaves with persistent wool; leaves of the main stem or main branches ovate to oblanceolate, toothed or cleft, ½ to 1 in. long, those of the branchlets numerous, sometimes crowded, ovate to linear, white-woolly or green, ½ to 2 lines long, with the margin bearing yellowish tack-shaped glands; involucres broadly turbinate to campanulate, their bracts gland-bearing; heads 20 to 35-flowered; pappus-bristles of inner flowers as long, of outer flowers shorter than corolla.—Plains and montane flats, 10 to 5000 ft.: inner South Coast Ranges; San Joaquin Valley; Inyo Co.; Mohave Desert; Colorado Desert; coastal S. Cal. July-Sept. Var. PECTINÀTA Jepson n. comb. Leaves pinnatifid with toothed segments; herbage very glabrate.—Monterey. (L. pectinata Greene.) Var. ALBIFLÒRA Jepson n. comb. Divaricately spreading, about ½ ft. high and 1½ ft. across; flowers white, about 8 in each head.—Rose sta., Kern Co. (L. albiflora Eastw.)

9. **L. ramulòsa** Gray. Stems slender, ⅓ to 1½ ft. high, loosely branching, granulose-glandular above or with minute tack-shaped glands; herbage tomentose to glabrate; lowest leaves spatulate or oblong, denticulate or entire, the upper lanceolate, mostly entire, those of the branchlets with partly clasping base; heads 10 to 25-flowered, 3 to 4 lines long, terminating diffuse slender branchlets; involucres turbinate or campanulate; corollas short, purple; pappus-bristles longer than the achene, 20 or more, paleaceous or more or less coalescent at base into sets.—Dry hills, 50 to 1500 ft.: Coast Ranges from Santa Clara and Marin Cos. to Mendocino Co. July-Sept. Var. ADENÓPHORA Gray. Upper herbage with tack-shaped glands more conspicuous; pappus-bristles in 5 paleaceous-aristiform sets or reduced to 5 awns.—North Coast Ranges in northern Napa Co., Lake and Colusa Cos. July-Aug. Var. MICROCÉPHALA Jepson n. comb. Stems and branchlets exceedingly slender, strict; upper leaves scale-like; heads very small, 3 to 5-flowered.—Foothills: Antioch; Eldorado Co. Aug. (L. leptoclada var. microcephala Gray. L. nemoclada Greene.)

53. **CÓRETHRÓGYNE** DC.

Perennial herbs, some resembling Lessingia, others Aster, but flowering in late spring or summer. Herbage whitened when young with a cotton-like tomentum, which is often deciduous in age. Heads radiate, solitary or corymbose or paniculate. Involucre hemispherical to turbinate, imbricated. Receptacle pitted. Rays purple, lavender or violet. Disk-flowers yellow. Ray-flowers sterile. Style-appendages comose or with a bearded tuft. Achenes silky or pubescent. Pappus reddish brown, of rigid capillary bristles, present in the disk, reduced or none in the ray. (Greek korethron, besom, and gune, style, on account of the brush-like tuft of hairs on the style tips.)

Stems decumbent or prostrate, flexuous.
  Heads 9 to 19 lines broad, including rays; style-branches completely exserted at height of anthesis ..... 1. *C. californica.*
  Heads 6 to 9 lines broad, including rays; style-branches only partially exserted at height of anthesis ..... 2. *C. leucophylla.*
Stems ascending to strictly erect; style-branches only partially exserted during anthesis.... 3. *C. filaginifolia.*

1. **C. californica** DC. Stems mostly prostrate or decumbent at base, densely leafy below, simple or somewhat branched, ⅓ to 1⅓ ft. high; herbage white with dense cottony tomentum, this deciduous from the upper parts of the plant and exposing the glandular-puberulent surface; leaves spatulate to obovate, narrowed to a distinct petiole, entire or serrate toward the apex, ¾ to 2 in. long, or the uppermost becoming reduced and bract-like; heads solitary on somewhat flexuous scape-like peduncles at the ends of the stems and branches; involucre campanulate, 4 to 4½ lines high, the outer bracts largely herbaceous; rays deep purple to lilac, 6 to 7 lines long, their minute sterile achenes bearing a pappus one or more of whose divisions are often developed in various paleaceous forms simulating inner bracts; style-branches densely comose, completely exserted at height of anthesis; pappus reddish brown.—Along the coast from San Mateo Co. to Humboldt Co. May-Aug. (C. obovata Benth. C. californica var. obovata Jepson.)

2. **C. leucophýlla** Menzies. Depressed somewhat scraggly plant, the decumbent stems ½ to 1 ft. long, bearing numerous ovate-spatulate leaves ½ in. long or less; herbage persistently white-woolly, the involucres less densely so; heads 6 to 9 lines broad; rays purple; style-branches densely comose, partially exserted during anthesis.—Sand dunes by the sea at Monterey: Pacific Grove; Pt. Pinos; Asilomar.

3. **C. filaginifòlia** (H. & A.) Nutt. Stems several from the root-crown, slender, flexuous, decumbent at base, commonly ascending, ½ to 1½ ft. high; tomentum often floccose-deciduous, the exposed surface scarcely or not at all glandular; leaves broadly oblanceolate, sharply serrate at apex or above the middle, gradually narrowed to a petiole, the whole 1 to 3 in. long; heads ¾ to 1 in. broad, solitary on the ends of the paniculate branchlets; involucres campanulate to turbinate, 3 to 5 lines long, the tomentum deciduous or mainly so; rays purple or violet.—Hillsides near the sea and ocean bluffs, Monterey Co. to San Diego. May-Sept. The species and its varieties are differentiated in the following key:

Inflorescence scarcely or not at all glandular; involucres campanulate to turbinate.
  Involucres with tomentum deciduous ..... *C. filaginifolia.*
  Involucres with tomentum persistent.
    Inflorescence open-paniculate ..... var. *linifolia.*
    Inflorescence contracted-paniculate ..... var. *lutifolia.*
Inflorescence markedly glandular-puberulent.
  Involucres campanulate to turbinate.
    Inflorescence paniculate ..... var. *rigida.*
    Inflorescence contracted-paniculate to virgate; heads 1 to several in axils of upper leaves ..... var. *glomerata.*
  Involucres hemispheric; inflorescence paniculate; typical ..... var. *pacifica.*

Var. LINIFÒLIA Hall. Herbage paler where tomentum is shed, scarcely if at all glandular; involucral bracts, or at least the tips, persistently woolly.—Foothills, 1000 to 3000 ft.: both sides of the San Joaquin Valley; coastal S. Cal. Var. LATIFÒLIA Hall. Herbage densely and persistently tomentose including the involucres; inflorescence contracted-paniculate; involucres turbinate, the bracts in about 5 series.—Montane, about 5000 ft.: San Bernardino

Mts.; s. to Mex. Var. RÍGIDA Gray. Stems several, erect or ascending, 10 to 20 in. high; herbage similar to the species; heads uniformly smaller, 6 to 8 lines broad; involucres campanulate, the tips of the bracts sometimes becoming recurved.—Sandy hills and dry cañon sides, 300 to 6000 ft.: South Coast Ranges; mts. of coastal S. Cal.; s. Sierra Nevada in Tulare Co. (C. filaginifolia var. virgata Gray. C. viscidula Greene. C. viscidula var. greenei Jepson.) Var. GLOMERÀTA Hall. Herbage densely tomentose except the glandular green-tipped involucral bracts; inflorescence virgate, the heads solitary on short peduncles along the axis or 2 to several in the axils of the scarcely reduced upper leaves.—Montane: San Bernardino Mts.; Tehachapi Mts. Var. PACÍFICA Hall. Stems several to many, stout, erect, 1 to 3 ft. high, simple or fastigiately branching with the branchlets of the inflorescence more spreading; herbage with floccose tomentum, deciduous from inflorescence at time of flowering, the exposed surface viscid, glandular-puberulent; involucres hemispheric; heads 8 to 12 lines broad; rays bluish purple.—Near the seashore, San Diego Co. (C. incana Nutt.)

54. **PSILÁCTIS** Gray

Branching annual. Heads rather small, hemispheric, radiate, solitary or loosely cymose. Involucral bracts unequal, closely imbricated in 2 or 3 series. Ray-flowers pistillate, fertile or often infertile. Disk-flowers perfect, fertile. Achenes compressed, pubescent. Pappus of ray-flowers none or an obscure ring; pappus of disk-flowers a row of slender bristles. (Greek psilos, naked, and actis, ray, the ray flowers without pappus.)

1. **P. còulteri** Gray. Stem freely branched at or just above the base, 4 to 12 in. high; herbage glandular-pubescent; leaves oblong to linear in outline, sharply toothed to pinnatifid, 5 to 14 lines long, sessile by a broad base or the lowermost petioled, those of the branchlets reduced to 2 to 4 lines; involucres 1½ lines high; bracts narrowly oblong to oblong-lanceolate, the inner ones whitish below; rays numerous, lavender; disk-flowers yellow; achenes linear, those of the disk with many unequal pappus-bristles.—Sandy alkaline flats, 1800 to 2200 ft.: Mohave Desert; e. to Nev. and Ariz., thence s. to Mex. May.

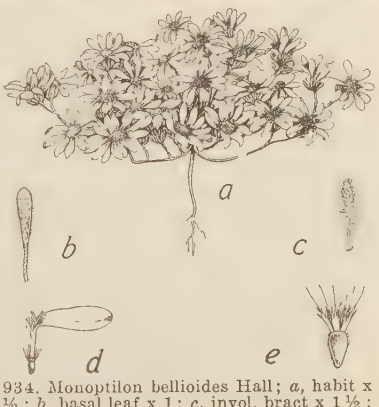
55. **MONÓPTILON** T. & G.

Low or depressed annuals with hirsute herbage. Leaves linear-oblanceolate or spatulate, entire, borne in a basal rosette and along the branches. Heads radiate, daisy-like in appearance, solitary on the ends of the branchlets or somewhat clustered. Involucre campanulate, its bracts linear, equal, hirsute. Receptacle flat. Ray-corollas white, sometimes violet or rose-tinged; disk-corollas yellow, the throat cylindric, 4 times as long as the short proper tube. Achenes narrowly obovate, compressed, marginally nerved, pubescent. Pappus present, alike in ray and disk, consisting of 1 to 12 awns, the paleae laciniate or none. (Greek monos, one, and ptilon, feather, in allusion to the solitary plumose bristle of the first species.)

Pappus a circle of very minute scales and 1 bristle which is conspicuously plumose above; corolla throat hairy on lower part.....1. *M. bellidiforme.*

Pappus awns 1 to 12, not plumose, alternating with shorter deeply laciniate or lacerate paleae; corolla throat glabrous or nearly so.....2. *M. bellioides.*

1. **M. bellidifórme** T. & G. Stem with several ascending or spreading branches from the base, the branches ½ to 2½ in. long; leaves 1 to 6 lines long; heads 3 to 8 lines broad; pappus-bristle nearly as long as corolla.—Desert flats and mesas, 2000 to 4000 ft.: Mohave Desert; Inyo Co.; e. to Utah. Apr.-May.



934. Monoptilon bellioides Hall; *a*, habit x ½; *b*, basal leaf x 1; *c*, involucral bract x 1½; *d*, ray-fl. x 1½; *e*, achene and pappus x 3.

2. **M. béllioïdes** (Gray) Hall. Fig. 934. DESERT STAR. Stems branching at or near the base, the branches ascending or widely spreading, ½ to 1 in. long; leaves 1 to 7 lines long; heads 4 to 8 lines broad; pappus-bristles about ½ as long as corolla.—Desert flats and mesas, 100 to 3000 ft.: Colorado Desert; e. Mohave Desert; Inyo Co.; e. to Utah and Ariz. Mar.-May. (Eremiastrum bellioides Gray.)

56. SÈRICOCÁRPUS Nees

Perennial herbs with erect leafy stems. Heads small, few-flowered, radiate, usually fascicled in terminal compact cymes. Flowers white, or the disk-flowers becoming purplish. Bracts of the involucre closely imbricated, whitish or coriaceous, green-tipped. Receptacle foveolate. Ray-flowers 5 (or 6); disk-flowers 8 to 16. Achenes narrow, a little compressed, 2-nerved, silky-pubescent. Pappus of numerous unequal scabrous bristles. (Greek serikos, silky, and karpos, fruit.)

1. **S. rígidus** Lindl. Stems erect, simple below the cymose inflorescence, 1 to 3½ ft. high, arising from a stoutish rootstock; herbage scabrous-puberulent; leaves commonly oblong, sometimes oblong-lanceolate, acute, entire or nearly so, sessile or the lower narrowed to a margined petiole, 1 to 4 in. long; heads somewhat turbinate, 3 to 5½ lines high, crowded, glomerate, about 15-flowered; involucral bracts linear, 1-nerved, the tips slightly spreading; rays 1¾ to 2 (or 3) lines long; achenes clavate; pappus white.—Open montane or openly wooded slopes, (500 or) 3500 to 7000 ft.: Sierra Nevada from Tulare Co. to Eldorado and Plumas Cos.; Humboldt Co. to Siskiyou Co.; n. to Wash. July-Oct.

57. TOWNSÉNDIA Hook.

Low tufted herbs with entire leaves. Heads large, broadly hemispheric, in ours solitary on scape-like peduncles. Rays purplish the disk-flowers yellow. Involucral bracts lanceolate, with scarious-ciliate margins. Receptacle areolate. Achenes obovate or oblong, strongly compressed, pubescent, with thickened or callous margins. Pappus a single series of bristles or in the ray reduced to small scales or paleae. (David Townsend, botanical associate of Dr. Wm. Darlington, famous early botanist of Pennsylvania.)

1. **T. scapígera** Eat. Annual or biennial; plants ¾ to 2 in. high; herbage hirsute; basal leaves spatulate, drawn down to a long narrowed base or petiole, the whole 6 to 13 lines long, the spatulate portion mostly about 2 to 4 lines long; involucral bracts linear to broadly lanceolate, 3 to 4 lines long; rays 3¾ lines long; both disk- and ray-achenes with pappus-bristles, the bristles conspicuously barbellate.—Rocky ridges, 5000 to 8000 ft., rare: Nelson Range, Inyo Co.; Warner Mts., Modoc Co.; e. to Nev. May.

58. ÁSTER L. ASTER

Mostly late summer or autumnal herbs, rarely shrubs. Stems leafy, the leaves merely toothed or entire. Heads radiate, usually numerous, paniculate, cymbose or racemose, sometimes solitary. Involucre turbinate or campanulate to hemispherical, the bracts in several ranks, often imbricated, herbaceous or often coriaceous and green-tipped. Receptacle flat, pitted. Ray-flowers pistillate, the rays blue, purple or violet. Disk-flowers perfect, yellow, sometimes changing to purple or brown. Style-branches flattened, their tips subulate or lanceolate, acute. Achenes more or less flattened. Pappus copious, of simple capillary bristles. (Greek astere, a star, from the star-like heads of flowers.)

A. HEADS SOLITARY ON ERECT STEMS OR AT THE SUMMIT OF MAIN BRANCHES.

More or less shrubby species peculiar to the Mohave and Colorado deserts and adjacent mts.; leaves narrowly oblong to obovate, spinose-toothed.

Herbage glabrous; involucral bracts linear-lanceolate, none especially elongated . . . . . 1. *A. orcuttii.*

Herbage more or less pubescent.

Leaves obovate; inner involucral bracts and occasionally others greatly elongated. 2. *A. cognatus.*

Leaves linear to lanceolate; inner involucral bracts not greatly elongated . . . . . 3. *A. tortifolius.*

Herb of the Sierra Nevada above 4000 ft.; leaves grass-like . . . . . 4. *A. andersonii.*

B. Heads many to numerous, rarely only one, borne in cymes, panicles or racemes.

1. Heads more than 3½ lines high; herbs.

Pappus not exceedingly copious nor obscuring rays in fruit.
Involucral bracts linear and attenuate to spatulate.
Herbage somewhat gray; leaves rather rigid, seldom more than 5 lines wide; plants of arid foothill valleys, or interior ridges or plateaus.
Tips of involucral bracts recurved in mature heads.
Leaves mostly toothed; bracts of the involucre conspicuously green-tipped; rays numerous; achenes compressed; pappus-bristles rigid .....5. *A. canescens.*
Leaves entire or mostly so; bracts of the involucre pinkish, commonly not green-tipped; rays comparatively few; achenes hardly compressed; pappus-bristles soft.....6. *A. shastensis.*
Involucral bracts not recurved; leaves entire.....7. *A. menziesii.*
Herbage green, bright or paler.
Leaves lanceolate to linear.
Branches of inflorescence not conspicuously bracteate.
Outer involucral bracts less than ½ line wide; leaves entire or nearly so; plants of montane regions...8. *A. adscendens.*
Outer involucral bracts about 1 line wide; plants of semi-arid to humid regions.
Leaves entire or subserrate.....9. *A. foliaceus.*
Leaves serrate .....10. *A. douglasii.*
Branches of inflorescence conspicuously leafy-bracteate; plants often of wet soil .....11. *A. chilensis.*
Leaves obovate or oblong to oblanceolate or the upper lanceolate.
Leaf-margins serrate.
Herbage not markedly scabrous nor rigid; leaf-margins bluntly serrate .....12. *A. greatai.*
Herbage markedly scabrous and rigid; leaf-margins sharply serrate. 13. *A. radulinus.*
Leaf-margins entire; involucral bracts often becoming reddish-margined. 14. *A. integrifolius.*
Involucral bracts ovate-lanceolate, becoming reddish-margined; leaves not rigid, somewhat glaucous; rays 6 to 7 lines long.....15. *A. engelmanni.*
Pappus exceedingly copious, exceeding rays in fruit; plants of alkaline situations..... 16. *A. frondosus.*

2. Heads less than 3½ lines high; plants of alkaline or saline situation.

Stems spineless.
Stems mostly simple, not rigid; upper leaves linear, thin; annual.....17. *A. exilis.*
Stems much branched, rigid; upper leaves reduced to subulate scales; shrub..... 18. *A. carnosus.*
Stems with spines in axils of cauline scales or leaves; herbage light green, glabrous; perennial herb .....19. *A. spinosus.*

1. **A. orcúttii** Vasey & Rose. Stems erect, branched, very leafy, woody below, forming a bush 1¼ to 2½ ft. high; branches erect, naked or nearly so for 1 or 2 in. below the solitary heads; bark white; herbage glabrous; leaves obovate to oblong, spinulose-toothed, acute, cuspidate, 1¼ to 2 in. long, the lower cuneate at base, the upper sessile by a broad base; heads large, 2 to 2½ in. broad; involucres hemispheric, 8 to 9 lines high; bracts closely imbricated, broadly lanceolate to linear-lanceolate, ciliate below the attenuate apex; rays purple or lavender, 2 to 3 lines broad, ¾ to 1 in. long; achenes white-villous.—S. Colorado Desert: Borrego Sprs.; Split Mt. Apr.

2. **A. cognàtus** Hall. Stems branched, erect, leafy up to the heads, woody below, forming a bush 10 to 20 in. high; bark white; herbage subglabrous or furnished with minute mostly scattered stipitate glands; leaves elliptic or oblong to narrowly obovate, spinose-dentate, sessile, ¾ to 1¼ in. long; heads 1½ to 2 in. broad, mostly solitary on the ends of the branchlets; involucres hemispherical; bracts ovate or lanceolate, attenuate, 6 to 7 lines long, or with a series of outer linear ones twice as long, at least the inner ones ciliate; rays blue or violet, 1 to 1½ lines wide, 8 to 10 lines long; achenes long-villous.—Colorado Desert: Shavers Well; Red Cañon near Mecca. June.

3. **A. tortifòlius** Gray. Stems leafy, more or less branched from a woody base, 1 to 2 ft. high; bark white; herbage tomentose-pubescent, the peduncles somewhat glandular; leaves linear or narrowly oblong to lanceolate, acute to acuminate, spinosely serrate, 1½ to 3 in. long; heads large (1½ to 2¾ in. broad), solitary on long usually bracteate peduncles; involucres shallow-hemispherical, ¾ to 1¼ in. wide, the numerous bracts lanceolate-subulate,

the longest about equaling the disk; rays numerous, pale purple or violet, ½ to 1 in. long; achenes silky-villous; pappus of coarse rigid tawny bristles, deciduous in a ring.—Desert mesas and mountain slopes, 2000 to 4000 ft.: Mohave Desert; Inyo Co.; e. to Utah.

4. **A. andersònii** Gray. Stems scape-like, few or several, erect or assurgent from the crown of a thick root, 5 to 15 in. high, the leaves mostly basal, erect; herbage glabrous or the peduncles a little woolly at the summit; basal leaves narrowly linear or linear-lanceolate, grass-like, acute, entire, nervose when dry, 2 to 8 in. long; leaves of the scape-like stems few, reduced to short bracts; heads ¾ to 1⅞ in. broad; involucres 3½ to 4½ lines high, their nearly equal bracts narrowly oblong, acute, scarious or reddish-margined; rays purple to light blue, 4 to 5½ lines long; style-appendages filiform.—Wet montane meadows, 4000 to 8200 ft.: Humboldt Co. to Trinity Co.; Sierra Nevada from Butte and Plumas Cos. to Tulare Co.; San Jacinto Mts.; e. to Nev. June-Aug.

5. **A. canéscens** Pursh. Stems leafy, erect or ascending, one or several from a biennial or perennial root, simple to much-branched, ½ to 1⅔ ft. high; herbage puberulent, the inflorescence glandular; leaves oblong or linear to oblanceolate, spinose-toothed or the upper entire, ½ to 1¾ in. long, those of the branchlets small and bract-like; heads in a cymose panicle; involucres broadly turbinate, 3½ to 4 lines high; bracts imbricated, green-tipped, the tips spreading or recurved; rays many to numerous, bluish-purple; achenes narrowed below, pubescent.—Dry situations, 5500 to 10,500 ft.: San Gabriel and San Bernardino mountains; Mt. Pinos; e. slope and e. side of the Sierra Nevada from Inyo Co. to Modoc Co.; Siskiyou Co.; e. to Ariz., n. to B. C. May-Sept. Var. TEPHRÒDES Gray. Involucre broad, canescent not glandular, the long green tips of the bracts attenuate.—Arid valleys: San Jacinto Valley; Colorado Desert; e. to N. Mex. Apr.-Aug.

6. **A. shastènsis** Gray. Stems several to many from the base, ascending or erect, arising from a short branched woody crown, 3 to 13 in. high; herbage finely canescent; leaves spatulate, attenuate below to a petiole, the whole ¼ to 1½ in. long, the upper leaves mostly linear and sessile, all the leaves entire or rarely few-toothed; heads 7 to 11 lines broad, borne in terminal panicles, rarely solitary; involucres campanulate; bracts commonly pinkish, the tips a little recurved or spreading, rarely herbaceous; ray-flowers few, sterile, the rays 2 to 3 lines long; achenes 5-nerved and with intermediate striae.—Montane, 6000 to 8000 ft., peaks of n. Cal.: Scott Mts.; Mt. Shasta; Medicine Lake; Lassen Peak. Aug.-Sept.

7. **A. menzièsii** Lindl. PURPLE ASTER. Stems simple, commonly several from the woody root, 1½ to 2 ft. high; herbage roughish-puberulent or sometimes almost glabrous; leaves linear to lanceolate, purple-veined beneath, remotely serrate or entire, sessile, subcordate at base, 1 to 2½ in. long, those of the raceme or thyrsoid panicle much reduced, so that the inflorescence seems almost naked; heads 3 to 5 lines high on rigid erect branchlets; involucre hemispherical or broadly turbinate, the bracts linear-spatulate in several closely imbricated ranks, the green tips obtuse; rays violet or purple.—Low dry ground, 100 to 4500 ft.: almost throughout cismontane Cal. from San Diego Co. to Shasta Co.; also w. Mohave Desert and Siskiyou Co.; s. Ore., w. Nev. Aug.-Dec. Var. BERNARDÌNUS Jepson n. comb. Herbage soft-pubescent; inflorescence leafy-bracteate. — Valleys, 500 to 1200 ft., coastal S. Cal. (A. bernardinus Hall.)

8. **A. adscéndens** Lindl. Stems slender, rigid, paniculately branched above, 1½ to 2 ft. high, arising from creeping rootstocks; leaves linear to oblanceolate, entire, strigose-hispidulous or glabrous with only the margins hispidulous, 1½ to 3½ in. long; cauline leaves sessile, somewhat clasping, the basal ones narrowed to long ciliate petioles with clasping more or less fringed bases and deciduous as the heads flower; heads rather numerous, loosely corymbose-paniculate; involucres broadly turbinate to campanulate, 2½ to 3 lines high, the bracts linear to spatulate, green-tipped; rays violet.—Montane, 3000 to 8000 ft.: Tulare Co. to Butte Co., thence nw. to Siskiyou Co.; e. to Col., n. to Mont. Aug.-Sept. Var. YOSEMITÀNUS Gray. Less rigid, the

leaves usually larger and hispidulous only on the margin, entire or sometimes subserrate; panicles leafy; heads few, larger, with looser involucre.—Wet meadows, 4000 to 6800 ft.: Sierra Nevada. Aug.-Sept. (A. yosemitanus Greene.) Var. FREMÓNTII Gray. Similar to var. yosemitanus but the stems stouter; panicles with reduced leaves; involucral bracts not long-pointed.—Grassy flats, 5700 to 8700 ft.: Sierra Nevada. (A. fremontii Gray.) Var. DELECTÁBILIS Jepson n. comb. Commonly more foliaceous than var. yosemitanus, the cauline leaves with expanded margins on each side of the clasping base; rays 5 to 7 lines long.—Montane meadows, 7000 to 9000 ft.: San Jacinto and San Bernardino mountains; s. Sierra Nevada. (A. delectabilis Hall.)

9. **A. foliàceus** Lindl. Stem erect or ascending, mostly simple, leafy, 10 to 20 in. high, from a creeping rootstock, pubescent above; leaves lanceolate, 2 to 6 in. long, glabrous, with margins subserrate to entire, ciliolate, the cauline sessile, the basal narrowed to slender winged petioles ⅔ the length of the blades; heads several in reduced panicles; involucres hemispherical, 3 to 4 lines high, the outer bracts linear or oblanceolate, foliaceous, the inner shorter, hyaline-margined, scarious below the middle; rays violet, 3 to 5 lines long.—Warner Mts., Modoc Co.; n. to Alas. Var. FRÓNDEUS Gray. Leaves broader, puberulent or nearly glabrous.—Mt. Bidwell, Modoc Co.; Plumas Co.; Tulare Co.; n. to B. C., e. to Col. Var. APRÌCUS Gray. Stems ascending from tufted rootstocks, 3 to 10 in. high; leaves usually shorter, somewhat thickened, more rigid, apparently glabrous; heads 1 to 3, 9 to 15 lines broad.—Mt. Bidwell, Modoc Co.; e. to Col., n. to Wash. Var. ÈATONI Gray. Stems erect, 2 to 3 ft. high; leaves more or less pubescent and scabrous; heads numerous.—Monterey Co. to Siskiyou Co. Var. HESPÈRIUS Jepson n. comb. Stem erect, 2 to 4 ft. high, the flowering branches many; leaves numerous, narrowly lanceolate, scabrous, puberulent or nearly glabrous.—Meadows and stream banks, 500 to 5000 ft.: coastal S. Cal.; Sierra Nevada from Tulare Co. to Butte Co.; Siskiyou Co.; n. to B. C. (A. hesperius Gray.)

10. **A. douglásii** Lindl. Stems leafy, slender, erect or ascending, simple or somewhat branched above, 2 to 3 ft. high; herbage glabrous or nearly so; leaves lanceolate, narrowed at both ends, commonly serrate along the middle, 3 to 5 in. long, 1½ to 6 lines wide; heads rather few in a narrow leafy panicle; involucral bracts linear, loosely imbricated, the inner green-tipped, the outer green throughout; rays purple.—Montane, along streams: Siskiyou Co.; n. to B. C.

11. **A. chilénsis** Nees. COMMON ASTER. Stems 1 to several from the base, erect, simple below, ending above in a narrow or sometimes broad panicle, 2 to 3½ ft. high; herbage villous-pubescent or more or less glabrous; leaves lanceolate, sessile, 5 in. long or less, entire, above passing gradually into the bract-like ones of the inflorescence, the basal oblong-spatulate, remotely serrate and attenuate into a petiole, all commonly with scabrous-ciliolate margins; panicle of loose leafy racemes ½ to 1¼ ft. long or more; heads 4 to 5 lines high; involucral bracts in several series, somewhat carinate, with green tips; rays white, lavender or bluish, 4 to 6 lines long.—Wooded hillsides, dry banks of gulches or streams, or in moist situations in fields, from the valleys to the foothills, 10 to 500 ft.: Coast Ranges from Humboldt Co. to Alameda Co. and s. to Santa Barbara Co.; e. to the Sacramento Valley and lower San Joaquin Valley. Sept.-Nov. Var. LÉNTUS Jepson. Slender, 4 to 6 ft. high, slightly succulent, mostly glabrous; heads few and large; rays 7 to 9 lines long.—Very common and conspicuous in the Suisun Marshes. Var. MÈDIUS Jepson. Branchlets of the inflorescence rather divaricate, with many spatulate-oblong or oblong-lanceolate spreading leaves 2 to 3 lines long; heads few, those on the same branchlets maturing at very unequal periods.—Lower Sacramento River; Saratoga. Var. INVENÙSTUS Jepson. Herbage cinereous-pubescent; upper leaves and those of the inflorescence small; involucral bracts spatulate-linear, thickish, obtuse, in rather few ranks, almost wholly herbaceous; rays dull purplish.—Calistoga. Var. SONOMÉNSIS Jepson. Slender, 1 ft. high, more glabrous; leaves mainly basal, oblong-spatulate, attenuate into a petiole ½ to as long as the blade, remotely serrate; cauline leaves reduced, sometimes petioled, linear to lanceolate, those of the cymose panicle subulate-lanceolate and closely ascending; heads soli-

935. Aster radulinus Gray; *a*, fl. branchlet x ⅛; *b*, leaf x ½.

tary or few at the ends of the strict branchlets; rays light pink to bright purple. — Subsaline lands: Petaluma; Napa.

12. **A. grèatai** Parish. Stems leafy, slender, erect, 1½ to 2½ ft. high, from branched creeping rootstocks; herbage scabrous-pubescent; lower leaves obovate to oblanceolate, tapering to a narrow base, toothed above the middle, ½ to 1⅜ in. wide, the basal ones with long slender winged petioles, the whole 3 to 8 in. long; upper leaves with broad auriculate-clasping base, mostly entire, becoming much reduced in the open panicle; involucral bracts lanceolate or linear, loosely imbricated, the outermost wholly green or whitish at base; rays light purple; achenes pubescent.— Cañons, San Gabriel Mts., 1000 to 3000 ft.: Eaton Cañon; Evey Cañon.

13. **A. radulìnus** Gray. BROAD-LEAF ASTER. Fig. 935. Stems ½ to 1½, seldom 2 ft. high, arising from branching rootstocks; herbage scabrous-pubescent; leaves oval-obovate to oblong, sharply serrate above the entire (often attenuate) base, 1 to 4 in. long, ½ to 2¼ in. wide; heads 7 to 13 lines broad, mostly numerous (sometimes very few), 5 to 6 lines high; involucres turbinate, 3 to 4 lines high; bracts imbricated, green-tipped, sometimes red-margined, the outer shorter, villous-puberulent; rays violet to whitish, 3 to 5 lines long; disk-corollas sometimes conspicuously reddish. — Foothills and mts., mostly wooded slopes, 200 to 5000 ft.: Coast Ranges from San Luis Obispo Co. to Siskiyou Co., thence se. in the Sierra Nevada to Nevada Co.; n. to Wash. July-Sept. (A. torreyi Porter.)

14. **A. integrifòlius** Nutt. Fig. 936. Stems leafy, 1 to several from a stout rootstock usually somewhat branched, ½ to 1 ft. high; herbage tomentose becoming glabrate, the inflorescence viscid-glandular; leaves oblong to spatulate or the upper lanceolate, entire or repand-serrulate, the upper ¾ to 1½ in. long, somewhat auriculate-clasping, the lower 3 to 6 in. long, ½ to 2 in. wide, tapering to a winged petiole; heads 10 to 12 lines broad, somewhat racemose; involucre broadly turbinate to campanulate, 5 lines high; bracts linear, few-ranked, ascending, the inner somewhat purplish- or red-

936. Aster integrifolius Nutt.; *a*, habit x ⅛; *b*, head x 1; *c*, *d*, disk-fls. x 1½.

dish-margined; rays 15 to 25, deep bluish-purple, 7 lines long; pappus tawny, rigid.—Montane, 7000 to 9000 ft.: Sierra Nevada from Tulare Co. to Lassen Co.; n. to Ore., e. to Col. July-Sept.

15. **A. engelmánni** Gray. Stem erect, leafy, simple or branched, arising from a perennial base, about 2 ft. high; leaves oblong to broadly lanceolate, apiculate, revolute, nearly glabrous, sometimes a little glaucous, sessile, 6 to 13 lines wide, 2 to 3 in. long, or the uppermost reduced; heads paniculate on bracteate peduncles; involucral bracts ovate-lanceolate, fimbrillate, the margins somewhat reddish or purplish; rays 5 to 10, purple, 6 to 7 lines long; pappus tawny.—Montane, Siskiyou Co.; n. to Wash., e. to Rocky Mts. Var. LEDOPHÝLLUS Gray. Leaves glaucous above, cottony-tomentose below; rays 2 to 5, light violet.—Del Norte Co.; n. to Wash.

16. **A. frondòsus** T. & G. Stems 3 to 12 in. high, several from the base and diffuse, or erect and simple, in either case ending in a narrow or racemose panicle or small cluster of heads; herbage nearly glabrous; leaves linear, entire, hispid-ciliate, ½ to 1¼ in. long; heads 3½ to 4 lines high; involucres hemispherical, the bracts linear or somewhat spatulate, obtuse, the outer foliaceous and loose; rays pinkish-purple, slightly exserted; achenes strigose-pubescent, the copious pappus sordid.—Alkaline soil, 2600 to 5000 ft.: e. side the Sierra Nevada from Inyo Co. to Modoc Co., thence w. to Siskiyou Co.; n. to Ida., e. to N. Mex. Aug.-Sept.

17. **A. exilis** Ell. SLENDER ASTER. Fig. 937. Stem erect, slender, 1 to 5 ft. high, ending above in a mostly rather narrow panicle; herbage glabrous; leaves linear, 2 to 4 in. long and 1 to 2 lines wide, or rarely some of the lower oblanceolate or oblong and 2 to 4 lines wide, entire, rarely serrate, those of the inflorescence lanceolate-subulate; heads 2 to 3 lines high; bracts linear, acute, herbaceous, scarious-margined; rays light pinkish-purple, 2 lines long; pappus fine and soft.—Saline soil or in marshes or ricefields, 10 to 1000 ft.: Sacramento Valley; s. to coastal S. Cal., thence e. to the Atlantic. Sept.-Oct.

937. Aster exilis Ell.; *a*, lower leaf x ⅜; *b*, infl. x ½; *c*, head x 1½; *d*, disk-fl. x 3; *e*, achene and pappus x 3.

18. **A. carnòsus** Gray. Stems slender, rigid, divaricately much-branched, woody below, forming a tangled almost leafless bush 2 to 3 ft. high; herbage pale green, glaucescent; lower leaves linear, fleshy, ¾ to 1 in. long, those of the branches reduced to small subulate scales; heads turbinate, terminating the branches; involucres 3 to 3½ lines high, the bracts linear, acute; rays none; pappus sordid; achenes pubescent.—Alkaline flats, 2000 to 3000 ft.: Mohave Desert; e. to Ariz. May-Sept.

19. **A. spinòsus** Benth. MEXICAN DEVIL-WEED. Stem slender, with reed-like almost leafless branches, 3 to 9½ ft. high; herbage light green, glabrous; lower leaves linear, ¼ to 2 in. long; upper leaves subulate or scale-like, often with spines (2 to 6 lines long) in or above their axils; heads 3 lines high, solitary on the ends of the branchlets or racemose on the branchlets; involucral bracts lanceolate, scarious-margined; rays white, drying brown, 1½ lines long; style-branches triangular-subulate; achenes glabrous.—Colorado Desert. Sept.-Jan.

59. **LEUCELÈNE** Greene

Low perennial herbs with many leafy stems from a woody root-crown. Leaves linear, entire. Heads small, radiate, solitary and terminal on the stems or branches. Involucre campanulate, its bracts imbricated in about 3 unequal series, green with scarious margins. Rays white, pink or reddish; disk-flowers yellow or reddish. Style-tips ovate or oblong, obtuse. Achenes slender, compressed, pubescent. Pappus a single series of scabrous bristles. (Etymology unknown.)

1. **L. èricoìdes** (Torr.) Greene. Stems densely tufted, wiry, erect or diffuse, 3 to 4 in. high, terminated by short-pedunculate heads, the branching woody base from a stout rootstock; herbage strigose-canescent, more or less glandular, the leaves hispid-ciliate; leaves linear-oblanceolate, or the lower spatulate, mucronate, 3 to 5 lines long; heads 5 to 7 lines broad; involucres 3 to 3½ lines high, their bracts lanceolate, acute; achenes pubescent. —Desert ranges, 2000 to 4000 ft., e. Mohave Desert: Cima; Providence Mts.; New York Mts.; e. to Col. (Aster ericaefolius Rothr.)

60. **ERÌGERON** L. Fleabane

Herbs, the stems leafy, or more or less naked and scape-like. Leaves entire, toothed or dissected, generally sessile. Heads corymbose, paniculate or solitary, commonly radiate, sometimes discoid. Involucre campanulate to hemispherical, its bracts narrow, mostly equal, little imbricated, seldom coriaceous or green-tipped. Receptacle flat or convex. Ray-flowers usually numerous, often in more than one series, pistillate, the rays white, purple or rarely yellow, linear to filiform, conspicuous, inconspicuous or none. Disk-flowers perfect, yellow, the marginal nerve of the corolla-lobes often forming a sort of hood at apex. Styles minute, their branches short, spatulate, obtuse, those of the disk-flowers shorter and broader. Achenes flattened, usually pubescent and nerved. Pappus of capillary bristles, more scanty and fragile than in Aster, sometimes with a distinct short outer series. (Greek eri, early, and geron, old man, "old man in spring.")

A. Stems more or less scape-like, the leaves mostly in a dense basal tuft from a branched or thickened root-crown; dwarfed high montane or alpine species.

Leaves, at least the basal, dissected ..... 1. *E. compositus.*
Leaves not dissected.
  Basal leaves linear to linear-lanceolate.
    Herbage hispidulose.
      Rays (or ligules) reduced to minute scales ..... 2. *E. austinae.*
      Rays (or ligules) exceeding disk ..... 3. *E. radicatus.*
    Herbage minutely pilose.
      Rays none; involucre woolly ..... 4. *E. bloomeri.*
      Rays present; involucre pubescent with spreading or appressed hairs.
        Root-crown compactly or obscurely branched ..... 5. *E. peucephyllus.*
        Root-crown freely branched ..... 6. *E. ursinus.*
  Basal leaves oblanceolate to spatulate; involucral bracts hairy, mostly purple-tipped ... 7. *E. algidus.*

B. Stems leafy.

1. Rays lacking.

Heads solitary, the involucral bracts equal; stems decumbent or ascending, the leaves unilateral on the decumbent portion ..... 8. *E. supplex.*
Heads usually several or numerous, sometimes solitary, the bracts unequal; leaves occasionally unilateral.
  Stems erect, 1 to 2 ft. high; herbage glabrous or sparsely hispid-pubescent ..... 9. *E. inornatus.*
  Stems usually decumbent or ascending, clustered on a thickish root-crown or rootstock, ¼ to ¾ ft. high; herbage canescently hirsute ..... 10. *E. miser.*

2. Rays present.

a. Rays inconspicuous, filiform, at most slightly surpassing the disk.

Stems from a short perennial (or biennial) rootstock; leaves linear to oblanceolate or spatulate, entire ..... 11. *E. lonchophyllus.*
Stems from a biennial or annual taproot.
  Lower leaves usually somewhat toothed.
    Involucre nearly glabrous, the bracts scarious-margined; heads very numerous in a many-branched panicle ..... 12. *E. canadensis.*

Involucre densely pubescent, at least the outer bracts herbaceous; heads rather few in a usually narrow panicle.....13. *E. linifolius.*
Leaves all entire; involucre somewhat hirsute; heads few in the inflorescence.....14. *E. acris.*

b. Rays conspicuous, much surpassing the disk.

Plants with an annual or biennial root; rays filiform or very narrowly linear, usually very numerous.
Stems diffusely branched from base; cauline leaves mostly entire, sessile, the basal 1 to 2½ in. long.....15. *E. divergens.*
Stems simple or branched above; basal leaves mostly much longer.
Cauline leaves auriculate-clasping, commonly toothed or serrate.....16. *E. philadelphicus.*
Cauline leaves sessile by a narrow base, or the lower petioled; inflorescence leafy.
Stem leaves all or nearly all serrate.....17. *E. annuus.*
Stem leaves entire or only the lower serrate.....18. *E. ramosus.*
Plants with a rootstock or thickened root-crown, perennial or sometimes biennial; rays broader, usually less numerous; basal leaves entire or merely toothed.
Stems from slender roostocks; mostly montane species.
Bracts equal.
Leaves obovate or oblanceolate to ovate or oblong, often serrate; heads usually solitary.....19. *E. coulteri.*
Leaves linear to narrowly oblanceolate, or spatulate, entire.
Heads usually corymbose; stems 1 to 1½ ft. high...20. *E. corymbosus.*
Heads solitary; stems 4 to 8 in. high.....21. *E. sanctarum.*
Bracts unequal.
Leaves filiform; herbage grayish with strigose pubescence....22. *E. linearis.*
Leaves linear to oblong or lanceolate or narrow-spatulate; herbage green.
Leaves thickened, densely hispidulose, 2 to 3 lines long; internodes 1 line long.....23. *E. jacinteus.*
Leaves not thickened, moderately to sparingly hispidulose; internodes 2 to 6 lines long.....24. *E. breweri.*
Stems from a thickened or branched root-crown (or from a thick rootstock in no. 28); heads solitary or commonly in a loose or open corymb or panicle.
Stems bearing an open corymb with mostly divaricate or spreading peduncles; herbage with a somewhat appressed-scabrous pubescence.25. *E. foliosus.*
Stems bearing solitary terminal heads or a few-headed inflorescence with erect peduncles.
Herbage silvery with soft appressed pubescence; Mohave Desert.....26. *E. parishii.*
Herbage green.
Basal leaves linear or oblanceolate to spatulate; heads ½ to 1⅛ in. broad; montane or inland species.
Stems mostly one or few, 1 to 2 ft. high.
Leaves linear; rays 3 to 4½ lines long; herbage retrorse-pubescent; Inyo Co.....27. *E. porphyreticus.*
Leaves lanceolate to obovate or oblong; rays 6 to 7 lines long; Sierra Nevada.....28. *E. salsuginosus.*
Stems usually numerous, 5 to 12 in. high.
Leaves oblong-lanceolate, chiefly basal; rays 1 to 1½ lines long.....29. *E. tener.*
Leaves linear to linear-spatulate or linear-lanceolate.
Herbage appressed-pubescent; leaves mostly 3 to 6 in. long; rays rather broadly linear, 4 to 5 lines long.....30. *E. nevadensis.*
Herbage conspicuously hirsute with spreading hairs; leaves mostly 1 to 3 in. long; rays narrower, 3 to 4 lines long.....31. *E. concinnus.*
Basal leaves broadly spatulate to obovate; heads 1¼ to 1½ in. broad; maritime species.....32. *E. glaucus.*

1. **E. compósitus** Pursh. Fig. 938. Tufted plant, the stems 1 to several, scape-like, one-headed, 1½ to 3 in. high, arising from the shortly branched and densely leafy root-crown; herbage hirsute; basal leaves 1 to 3-ternately parted into narrow lobes, 2 to 6 lines long, borne on hirsute-ciliate petioles 2 to 12 lines long, those of the flowering stems few (much-reduced, 3-lobed or entire) or none; heads 8 to 11 lines broad; involucres somewhat glandular, 2½ to 3½ lines high, equaling the disk, the bracts linear, acuminate, equal; rays 30 to 60, white to purple or violet, 2 to 3 lines long.—Alpine and subalpine, 7100 to 11,750 ft.: Sierra Nevada from Mt. Whitney to Castle Peak; n. to B. C., e. to Rocky Mts. June-July. Var. DISCOÏDEUS Gray. Rays shorter than the pappus, very variable in the same heads, often with fimbriated margins, or with 1 to 3 filiform divisions.—Sierra Nevada, 9000 to 13,000 ft.

2. **E. áustinae** Greene. Tufted plant, the many stems scape-like, 1 to 3½ in. high, arising from a shortly branched and densely leafy root-crown; herbage hispid with spreading hairs; leaves narrowly spatulate to linear, ½ to

938. Erigeron compositus Pursh; *a*, habit x ⅔; *b*, leaf x 1½; *c*, another leaf type, lowest on shoots x 2½.

2¼ in. long; heads hemispherical, 6 to 7 lines broad; ray-flowers with the rays reduced to minute scales; disk-flowers very numerous; achenes pubescent with spreading hairs.—Open fields, about 5500 ft.: Modoc Co.; n. to Ore. May-July.

3. **E. radicàtus** Hook. Densely tufted plant, the scape-like stems 1 to 4 in. high, arising from a stout very shortly branched or condensed root-crown; branches of the root-crown roughened and gray or black with the persistent bases of old leaves; herbage densely gray-hispidulous; basal leaves linear-spatulate, ½ to 1½ in. long, the cauline few and much reduced, narrowly oblanceolate to linear; heads solitary (or rarely 1 or 2 younger heads in axils of lower cauline leaves), 6 to 9 lines broad; involucral bracts lanceolate-linear, subequal, about equaling disk, hairy, somewhat glandular, the inner scarious-margined below; rays white or purple, 3 to 5 lines long; pappus tawny, single, equaling the disk.—Alpine summits, 9500 to 12,500 ft.: Sierra Nevada from Tulare Co. to Tuolumne Co.; White Mts.; n. to Can., e. to Rocky Mts. (E. nevadensis var. pygmaeus Gray.)

4. **E. bloómeri** Gray. Tufted plant, the stems several, scape-like, 2½ to 7 in. high, arising from the densely leafy and branched root-crown; herbage somewhat appressed-pubescent to glabrate; basal leaves narrowly linear, sometimes a little dilated upward, 1 to 2½ in. long; cauline leaves few, nearly filiform; heads turbinate, 3½ to 4½ lines high; involucral bracts equal, linear-lanceolate, villous or canescent; rays none; achenes glabrate or sericeous, oblong-linear, flat; pappus soft, whitish, simple, shorter than corolla.—Montane, 2700 to 7000 ft.: Yollo Bolly Mts. to Siskiyou Co.; Sierra Nevada from Nevada Co. to Modoc Co.; n. to Ore. and Ida. May-July.

5. **E. peucephýllus** Gray. Tufted plant, the stems several or many, scape-like, erect, simple or sometimes forked, about 3 to 5 in. high, arising from the rather freely branched root-crown; herbage somewhat canescent; leaves narrowly linear, 1 to 2 in. long, mostly basal; involucral bracts lanceolate, equal, surpassed by the disk; rays 20 to 30, cream-color or yellow, oblong-ovate, 3 to 4 lines long.—Modoc Co.; n. to B. C., e. to Nev. and Ida. June-July.

6. **E. ursìnus** Eat. Densely tufted plants, the root-crown much branched and matted with persistent brown leaves of former years; stems ascending or erect, flexuous, 2 to 6 in. high; herbage finely pilose; leaves linear-lanceolate to narrowly oblanceolate with midnerve evident, especially toward base, 1 to 1¾ in. long; heads 1 to 1¼ in. broad, solitary on the scape-like stems, somewhat nodding; involucral bracts linear-lanceolate, somewhat glandular, pubescent, subequal, about 3 lines long, mainly equaling disk; pappus copious, equaling disk or with some of the bristles reduced suggesting an outer pappus; rays about 50, white to lavender or purple, 3 to 5 lines long.—Mountain flats, 6000 to 9000 ft.: Sierra Nevada from Tulare and Tuolumne Cos. to Lassen Co. (E. nevadensis var. sonnei Smiley. E. elegantulus Greene.)

7. **E. álgidus** Jepson n. sp. Stems simple, scape-like, usually several from a thickened or branched root-crown of a rootstock, 1½ to 7½ in. high; herbage green with rather fine sometimes sparse pubescence; leaves mostly in basal tufts, spatulate to oblanceolate, entire, narrowed to slender ciliate

petioles, the whole ½ to 3 in. long, the cauline 2 or occasionally more, linear, bract-like, 2 to 12 lines long; involucral bracts narrowly lanceolate, slightly glandular, often dark-purplish, hirsute, 3 lines long, about equaling the disk; rays about 50, lavender to purple, 3 to 4 lines long; pappus copious.—Alpine, 9000 to 13,000 ft.: Sierra Nevada from Tulare Co. to Mariposa and Nevada Cos. (Mt. Lyell, Jepson 3349, type); e. to Col. and Wyo. (E. ursinus of Gray etc., not of Eat.)

8. **E. súpplex** Gray. Stems decumbent or ascending 4 to 8 in. high, terminated by a single broad short-peduncled head 6 to 9 lines broad; herbage sparingly hirsute-pubescent or almost glabrous, the involucre canescently hirsute; leaves linear-spatulate to linear-lanceolate, 1 to 2 in. long; bracts of involucre equal, linear-lanceolate; rays none.—Along the coast from Sonoma Co. to Humboldt Co. June.

9. **E. inornàtus** Gray. PINE ERIGERON. Stems few to several from the root-crown, erect, simple or sparsely branched, 1 to 2½ ft. high, the stem on the branches ending above in a low broad corymb with divaricate or ascending branches; herbage nearly glabrous above, more or less hispidly pubescent toward base; leaves linear, 1 to 2¼ in. long, 1 to 2 (or 3) lines wide; heads 4 to 6 lines broad, about 5 to 20 in the corymb; involucres broadly campanulate; bracts unequal, somewhat imbricated, glandular, sometimes puberulent or pubescent; rays none.—Pine forests or along river bluffs: North Coast Ranges, 100 to 3500 ft., from Sonoma and n. Lake Co. to Siskiyou Co.; Sierra Nevada, 3500 to 7000 ft., from Tulare Co. to Modoc Co.; n. to Wash. July-Aug. Var. VISCÍDULUS Gray is the viscid state.

10. **E. mìser** Gray. Stems several, somewhat tufted on the short woody branched root-crown, erect or ascending, densely leafy, 3 to 10 in. high; herbage canescently hirsute; leaves linear-oblong, or cuneately narrowed towards the base, ½ to 1 in. long, sometimes borne chiefly on one side of the stem; heads 3½ to 4 lines high, few in a rather close corymb; involucres campanulate, the bracts imbricated; rays none.—Rocky ridges, 2000 to 8000 ft.: Coast Ranges from Mt. Hamilton to Siskiyou Co.; Sierra Nevada from Eldorado Co. to Modoc Co. July-Aug.

11. **E. lonchophýllus** Hook. Stems erect, leafy, strict, 1 to several from a biennial (or perennial) root, 4 to 15 in. high; herbage (especially the stems) hirsute with spreading hairs to glabrate; leaves spatulate to linear or oblanceolate, mostly narrowed below, the basal tapering into a long petiole, the whole 1 to 4 in. long; heads few, 5 to 9 lines broad, often somewhat racemose-paniculate; involucres hemispherical, the bracts lanceolate; rays filiform, inconspicuous, slightly surpassing the disk; pappus copious, fragile.—Dry or moist meadows, 7000 to 9500 ft.: Sierra Nevada from Tulare Co. to Mono and Tuolumne Cos.; n. to Can., e. to Col. July. (E. armeriaefolius of Bot. Cal.)

12. **E. canadénsis** L. HORSEWEED. Fig. 939. Stem erect, simple below, paniculately branching above, 2 to 5 ft. high; herbage hispid with scattered hairs or nearly glabrous, especially above; leaves linear to lanceolate, entire or the lower ones toothed, 2 to 3 in. long, the lowest spatulate or narrowed to a petiole; heads small (1½ to 2 lines high), very numerous in a dense panicle; rays very short and inconspicuous, white, 2-

939. Erigeron canadensis L.; *a*, leaf x ½; *b*, infl. x ½; *c*, head x 2; *d*, achene and pappus x 6.

toothed.—Common weed in waste or half-cultivated lands, nat. from the e. U. S. Aug.-Oct.

13. **E. linifòlius** Willd. Stem erect, simple or with long simple branches, densely leafy, ¾ to 2 ft. high, ending above in a raceme of heads or a racemose panicle; root annual or biennial; herbage conspicuously hispid-pubescent; leaves linear to narrowly spatulate, ¾ to 2¼ in. high, the lower few-toothed; heads rather few; involucres densely pubescent; bracts linear-subulate, at least the outer herbaceous; rays white, very narrow and short, not exceeding the disk; pappus sordid or somewhat tawny.—Waste places about towns, nat. from the Am. tropics: Oakland; Pasadena; Redlands; San Diego.

14. **E. àcris** L. Stems one or few from a usually biennial root, 4 to 12 in. high; herbage hirsute to glabrate; leaves narrow, entire, the basal ones narrowly spatulate, drawn down to a narrow base or petiole, 1 to 3¼ in. long, the cauline ones narrowly spatulate to linear, 1 to 1½ in. long; heads 5 to 9 lines broad, rather few, short-peduncled and racemose along the summit of the stem, or the peduncles longer and somewhat corymbose; pappus copious, fragile; rays purple, numerous, very slender, equaling the disk, or surpassing it by 1 to 1½ lines; disk with a row of pistillate flowers with tubular corollas inside the rays.—Grassy flats, e. side the Sierra Nevada, 7000 to 9000 ft., rare: Inyo Co.; betw. Bridgeport and Mono; e. to Col., n. to Can. and Alas. Aug.-Sept.

15. **E. divérgens** T. & G. Stems several to many, ascending, from an annual or biennial taproot, sometimes decumbent at base, 4 to 12 or 16 in. high; herbage shortly hispid-pubescent; basal leaves oblanceolate to obovate, entire or rarely somewhat incisely toothed, rarely deeply pinnatifid, 1 to 2½ in. long, including the petiole; upper leaves linear to linear-spatulate, entire, ½ to 1½ in. long; heads 7 to 9 lines broad, solitary or somewhat corymbose, on long slender peduncles; involucres 2 lines high; bracts linear, acuminate, more or less membranous-margined, hirsute with white spreading hairs; rays numerous, filiform, violet to white, 2 to 3 lines long; pappus sordid, scanty, fragile, equaling the disk, also a variable short outer pappus of squamellae or simple strigae.—Arid flats, foothills or mountain slopes, 500 to 6700 ft.: Colorado and Mohave deserts and their bordering mts.; Sierra Nevada; Siskiyou Co.; n. to Wash., e. to Neb. Apr.-Aug. (E. californicus Jepson.)

940. Erigeron philadelphicus L.; *a*, fl. branchlet x ½; *b*, leaves x ½.

16. **E. philadélphicus** L. Skevish. Fig. 940. Stem simple, 2 to 3 ft. high, commonly branched only at or near the summit; herbage hispidly pubescent; leaves spatulate or obovate, serrate or coarsely few-toothed, the basal (including the long margined petioles) 4 to 11 in. long, the cauline with auriculate-clasping base, 1 to 4 in. long; heads corymbose, commonly on rather long peduncles, ½ to 1 in. broad; rays white or pink, numerous, narrow.—Along streamlets and by springy places in the hills and valleys, 100 to 4000 ft.: coastal S. Cal.; Coast Ranges; Sierra Nevada; n. to B. C., e. to the Atlantic.

17. **E. ánnuus** Pers. Stems stout, leafy, erect, corymbosely branched above, 2 to 4 ft. high, from a stout branched root; pubescence sparse, that of the leaves and branchlets appressed; leaves broadly ovate to obo-

vate or oblong-lanceolate, 2 to 5½ in. long, coarsely serrate, sessile by a narrow base or the lower tapering to a winged petiole 1½ times as long; upper leaves narrowly ovate or lanceolate, serrate or entire, smaller; heads numerous, in a leafy panicle; involucres with a few bristly hairs; disk 3 to 3½ lines broad, slightly surpassed by the subequal lanceolate bracts; rays numerous, narrowly linear, 3 to 4 lines long.—Nat. from e. U. S. in Humboldt Co.: Hydesville; Eureka. July.

18. **E. ramòsus** (Walt.) B. S. P. Stems several from a biennial root, erect, simple below, branching above and forming a corymbose panicle, 1½ to 4 ft. high; herbage roughish-pubescent; leaves oblong-obovate, coarsely serrate or entire, drawn down to a winged base or petiole, the whole 1½ to 6 in. long; upper leaves lanceolate or linear, entire, ¾ to 2 in. long; panicle somewhat leafy, the heads few to several; heads 5 to 10 lines broad; involucres 1½ to 2 lines high; rays numerous, white, 2½ to 3½ lines long; pappus-bristles comparatively few (6 to 12), with many short bristles ⅓ as long.—Nat. from e. U. S.: Nature's Rest, lower Klamath River; Hydesville, Humboldt Co.; Plumas Co.; Yosemite Valley. July. (E. strigosus Muhl.)

19. **E. còulteri** Porter. Stems erect, leafy, arising from a slender rootstock, 1 to 2 ft. high, simple and one-headed, or about 3 to 5-branched with the branches rather strict and one-headed; herbage more or less hirsute-pubescent; lower leaves oblanceolate or narrowly obovate, somewhat serrulate, narrowed to a winged base or petiole, the whole 2 to 6 in. long, the upper oblong or lanceolate with clasping base, 1 to 4 in. long; heads ⅞ to 1½ in. broad; involucral bracts equal, lanceolate, surpassing the disk; rays 50 to 80, narrowly linear, white to purplish, 5 to 6 lines long.—Montane, 6000 to 10,000 ft.: Sierra Nevada from Tulare Co. to Nevada Co.; e. to Rocky Mts. June-Aug. (E. frondeus Greene.)

20. **E. corymbòsus** Nutt. Stems few or several, branching, leafy, erect or at base decumbent, 1 ft. high, arising from creeping rootstocks; herbage thinly pubescent with rather long spreading hairs; leaves linear to narrowly spatulate, entire, 1 to 1¾ in. long; heads 1¼ to 1¾ in. broad, several in a corymbose cluster, or sometimes solitary; involucres 2½ to 3 lines high, the equal bracts narrowly lanceolate; rays 30 to 50, mostly narrow, 3 to 6 lines long, blue, lilac or white.—Mountain slopes, 2500 to 4500 ft.: Buck Mt., Humboldt Co.; Lassen Co.; n. to Wash. July.

21. **E. sanctàrum** Wats. Stems slender, leafy except above, 1 to several from a slender rootstock, 3 to 8 in. high, terminated by a single pedunculate head; herbage rough-pubescent, the involucre densely so; leaves spatulate-obovate to oblanceolate or linear, entire, ½ to 1¼ in. long; heads large, the disk 6 to 7 lines broad, about equaled by the bracts; rays many, purple to white.—San Luis Obispo and Santa Barbara Cos.; Santa Barbara Isls. May-June.

22. **E. lineàris** Piper. Stems many, slender, erect, ½ to 1 ft. high, arising from a depressed branched or short woody root-crown, simple and one-headed, or with about 2 or 3 one-headed branches at summit; herbage appressed-pubescent; leaves crowded below, linear-filiform or the lower slightly dilated upward, ¾ to 1½ in. long; heads 9 to 11 lines broad; involucres 1¾ to 2¼ lines high; rays 30 to 50, purple, violet or white, 3 to 5 lines long; achenes slightly pubescent or glabrate; pappus simple, the bristles fragile.—Arid slopes, 2800 to 8000 ft.: Providence Mts.; Lassen, Modoc and Siskiyou Cos.; n. to B. C. June-July.

23. **E. jacínteus** Hall. Stems few to several, erect or ascending, 2 to 3 in. high, leafy, arising from slender branched rootstocks, ending above in a solitary head on a peduncle ½ in. long; herbage evenly and densely hispidulous; leaves spatulate to obovate, 1 to 4½ lines long, exceeding the internodes, all sessile; heads hemispherical, 7 to 9 lines broad; involucres 2 lines high, their bracts narrow, acute, with green midrib and scarious margin; rays about 20, narrow, purple, 2 lines long; achenes flattened, more or less appressed-pubescent, sometimes only so at summit; pappus simple, the scabrous bristles equaling the disk-corollas.—Rocky ridges, about 9000 ft.: San Antonio and San Jacinto mountains.

24. **E. brèweri** Gray. Stems several to many, leafy, slender, erect or ascending, simple or corymbosely branched above, 7 to 15 in. high, arising from the branched crown of a long slender rootstock; herbage hispidulose, a little grayish; leaves linear to oblanceolate, narrow-spatulate, entire, ¾ to 1½ in. long; heads solitary or few in a corymb, the peduncles bracteate; involucres 2 lines high, their bracts unequal, oblong to lanceolate or linear, glandular-puberulent to glabrous; rays mostly 10 to 20, violet, 2 to 3½ lines long.—Rather dry often sandy situations, 4000 to 9000 ft.: San Bernardino Mts. (Big Mdws.); Sierra Nevada from Kern Co. to Lassen Peak; Mt. Shasta. Var. ÉLMERI Jepson n. comb. Stems weaker than in the species, decumbent, 5 to 8 in. long; leaves smaller, more sparingly pubescent.—Among rocks, 7200 to 9000 ft.: Sierra Nevada from Mariposa Co. to Tulare Co. (E. elmeri Greene.)

25. **E. foliòsus** Nutt. Stems many from the base, erect, simple, branching above, 1 to 2 ft. high, arising from the branched root-crown of a short taproot; herbage strigose-hispidulous or somewhat scabrous; leaves more or less crowded on the stems, reduced on the branches of the inflorescence, narrowly linear or lanceolate, ¾ to 2 in. long, 1 to 2 lines wide; heads hemispherical, 10 to 13 lines broad, rather few in an open terminal corymb, the branches often spreading or ascending-divaricate, broad; bracts lanceolate, unequal, glandular and mostly puberulent or pubescent; rays about 30 to 40, 2 to 6 lines long; achenes nerved, the nerves hirsutulose; pappus coarse and tawny.—Along the coast and on river banks or moist hillsides of the interior, 200 to 5000 ft.: Humboldt Co. to coastal S. Cal.; Sierra Nevada foothills (Amador Co. to Mariposa Co.). May-Aug. Var. STENOPHÝLLUS Gray. Leaves 1 line or less wide, often filiform; heads 6 to 10 lines broad; rays fewer than in species and narrower; some plants with several rayless heads, these similar to E. inornatus.—Drier situations, 100 to 6000 ft.: San Joaquin Valley; w. Mohave Desert; coastal S. Cal. May-June. (E. fragilis Greene. E. setchellii Jepson.) Var. BLÓCHMANAE Hall. Achenes glabrous or nearly so.—Near the coast: San Luis Obispo Co.; n. Santa Barbara Co. (E. blochmanae Greene.) Var. HARTWÈGII Jepson n. comb. Herbage sparsely strigose; leaves narrowly linear, 1 to 2 in. long.—Foothills, 800 to 1600 ft.: n. Sierra Nevada foothills from Amador Co. to Butte Co.; inner North Coast Ranges. May-June. (E. hartwegii Greene.) Var. CONFÍNIS Jepson n. comb. Flowering stems decumbent, arising from a long much-branched woody root-crown, 3 to 8 in. high, ending above in 1 or several heads; herbage sparsely to cinereous-pubescent.—Rocky ridges, 5000 to 7000 ft.: ne. Humboldt Co. to w. Siskiyou Co.; n. to southern Ore. (E. confinis Howell.)

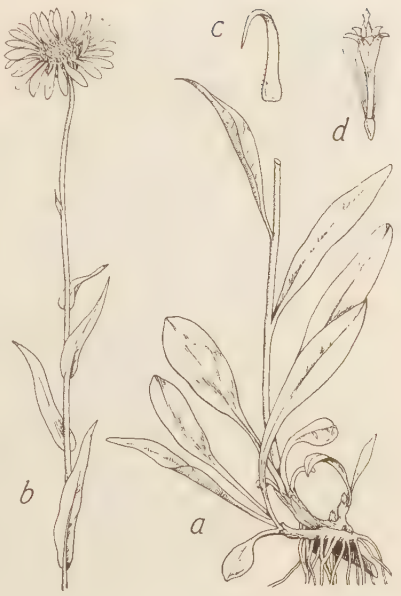
26. **E. parishii** Gray. Stems many, slender, erect or ascending, somewhat tufted on the branched woody root-crown, 7 to 12 in. high, mostly simple and one-headed or with 2 to 5 one-headed branches above; herbage silvery with soft appressed hairs; leaves narrowly oblanceolate to linear, drawn down to a narrow base, ½ to 1½ in. long; involucres greenish, puberulent, 3½ lines high; bracts linear-lanceolate, shorter than the disk; rays violet or purple, 4 to 5 lines long.—Cushenberry Sprs., Mohave Desert. May-June.

27. **E. porphyrèticus** Jones. Stems few to several, slender, leafy, branched, erect or somewhat flexuous, 1 to 2 ft. high, arising from a thick woody root-crown; herbage retrorse-pubescent with stiffish hairs; leaves linear to spatulate-linear, ½ to 1¼ in. long; heads solitary on the ends of the branches, rather long-peduncled; involucres 2 to 3 lines high, their bracts unequal; rays many, narrow, purple, 3 lines long.—Arid areas, 4000 to 5000 ft., Inyo Co.: Lone Pine; Deep Spring Valley; e. to Nev.

28. **E. sálsuginòsus** Gray. Fig. 941. Stem simple, erect or ascending, leafy, commonly ½ to 1½ ft. high, arising from a short thickish rootstock, commonly with a single terminal head, rarely 2 or 3; herbage glabrous or glabrate below, pubescent above; leaves erect; basal and lower cauline leaves oblanceolate to oblong-spatulate, scabrous-ciliolate, attenuate below into a margined petiole, the whole 2 to 5 in. long; upper cauline leaves ovate-oblong to lanceolate, sessile, conspicuously mucronate or apiculate-acuminate, the uppermost small and bract-like; heads 1¼ to 1¾ in. broad; involucral bracts

loose or even spreading, linear-subulate or attenuate, viscidulous; rays 50 to 70, purple or violet, 6 to 7 lines long.—Montane, 5500 to 10,000 ft.: Sierra Nevada from Tulare Co. to Nevada Co.; e. to N. Mex., n. to Alas. and w. Can. June-Aug. Var. ANGŬSTIFŎLIUS Gray. Stems ½ to 1 ft. high; basal and lower cauline leaves narrowly spatulate to lanceolate, the upper cauline linear-lanceolate, small; rays about 40.—Montane, 6200 to 10,000 ft.: Sierra Nevada from Tulare Co. to Nevada Co.; n. to Wash. July-Aug.

29. **E. tĕner** Gray. Stems filiform, erect, several from the root-crown, 3½ to 7 in. high, ending in a single head or a corymb of 2 or 3 long-peduncled heads; leaves oblong-oblanceolate, acute, ½ to 1 in. long, narrowed to a long petiole 1 to 1½ times as long; herbage finely villous; heads 5 to 8 lines broad; rays blue, 1 to 1½ lines long.—Montane peaks, 7000 to 9000 ft.: Scott Mts.; Silver Mt., Alpine Co.; e. to Nev. Aug.



941. Erigeron salsuginosus Gray; *a*, *b*, habit x ½; *c*, bract x 4; *d*, disk-fl. x 2½.

30. **E. nevadénsis** Gray. Stems several to many, erect or at base decumbent, 5 to 10 in. high, arising from a branched root-crown, simple and one-headed or with 2 or 3 one-headed branches at summit; herbage appressed-pubescent; leaves long and narrowly lanceolate to linear, 1 or 3-nerved, the basal in one erect tuft, attenuate below to a narrow base or slender petiole, the whole 3 to 6½ in. long, the uppermost small and linear or subulate; heads about ¾ in. broad, solitary, peduncled, often somewhat nodding; involucres 3 lines high, villous-pubescent, sometimes glabrate, their bracts equal; rays broadly linear, white or pale blue, 4 to 5 lines long; achenes comparatively large; pappus rather coarse, of 20 to 30 bristles.—Montane dry meadows, 4200 to 8500 ft.: Plumas Co. to Shasta and Modoc Cos. June-July. (E. plantagineus Greene.)

31. **E. concínnus** T. & G. Stems many, erect or at base decumbent, leafy, simple and one-headed or corymbosely few-branched above, 5 to 14 in. high, arising from the thickened or shortly branched root-crown; herbage pale, hirsute with harsh spreading hairs, sometimes white-shaggy at base; leaves linear to linear-spatulate, ¾ to 3½ in. long; heads somewhat long-peduncled; involucral bracts linear-lanceolate, equal, 2 to 3 lines long, about equaling the disk; rays many, blue or white, 3 to 4 lines long; pappus scanty, about equaling disk, with an evident striate-membranous outer circle ⅓ to ¼ as long, this outer circle readily separating into broad paleaceous divisions or hair-like scales; rays blue or rarely white, 2 to 3 lines longer than disk.—Arid slopes, 3000 to 5000 ft.: Sierra Co. to Modoc Co., thence w. to Siskiyou Co.; n. to Can., se. to Ariz. July. Var. APHANÁCTIS Gray. Ray with the corolla reduced to a toothed or fimbriated tube; style exserted.—Rocky slopes, 3000 to 6000 ft.: e. of the Sierra Nevada from Inyo Co. to Lassen Co.; e. to Nev. Var. CONDENSÀTUS Eat. Dwarf, 1 to 2½ in. high, densely tufted on a stout branched woody root-crown; herbage gray with hirsute spreading hairs; stems scapose, sparsely leafy at base; rays very short or none.—Summits, San Bernardino Mts.: Mt. San Gorgonio; Sugarloaf Mt.; e. to Nev. where it is said to intergrade with var. aphanactis. Var. ERĒMICUS Jepson n. var. More compact, the basal tufts more numerous with stems of mostly even height, making a broad flat-topped plant 3 to 5½ in. high; herbage more rigid; heads more showy, the rays 5 to 7 lines long.—Rocky ridges, 3000 to 4000

942. Erigeron glaucus Ker.; *a*, habit x ⅜; *b*, fl. head x ½; *c*, head of unopened fls. x ⅜.

ft., e. Mohave Desert: Cima; Providence Mts.; New York Mts. (Jepson 5464, type).

32. **E. gláucus** Ker. SEASIDE DAISY. Fig. 942. Stems erect, 4 to 8 (or 10) in. high, commonly one-headed, arising from a basal tuft of leaves on the fleshy root-crown, and often, also, from rosulate offsets terminating prostrate woody branches; stems pilose-pubescent, leaves finely puberulent, heads somewhat tomentose; leaves spatulate, obovate, entire, rarely with a small tooth on either side below the apex, 1 to 4 in. long; upper cauline leaves small and scattered; heads large, 1¼ to 1½ in. broad; rays numerous, lilac or violet.—Common on cliffs or sandy shores, near the sea only, 10 to 100 ft.: San Miguel Isl.; Monterey Co. to Humboldt Co.; n. to Ore. May-Aug.

61. BÁCCHARIS L.

Perennial herbs or shrubs, commonly resinous or glutinous. Branches commonly striate or angled. Heads discoid, many-flowered, small (mostly 3 or 4 lines high), borne singly or in clusters on the ends of branchlets and aggregated in panicles or corymbs. Involucre imbricated. Flowers whitish or yellowish, dioecious. Staminate (or sterile) flowers with tubular corolla slightly dilated at the throat, the limb cleft into 5 linear lobes; ovary abortive; style present. Pistillate flowers with the corolla very slender and thread-like, truncate at apex or with 5 obscure closely erect teeth, much shorter than the style; stamens none. Pappus of capillary minutely scabrous bristles, in the sterile plant scanty and tortuous, in the pistillate very long and copious. (The god Bacchus.)

A. Achenes 10-nerved; leaves not willow like.

Pappus of flowers copious, soft and fine, conspicuously elongating in fruit; receptacle naked.
  Leaves all obovate; heads in sessile glomerules in a leafy panicle.....1. *B. pilularis.*
  Leaves, at least the uppermost, linear; panicle naked or less leafy.
    Pappus bright white; branchlets of the panicle bearing glomerules of heads.....
      2. *B. emoryi.*
    Pappus brownish; branchlets of the panicle bearing mostly 1 head.....
      3. *B. sarothroides.*
Pappus of pistillate flowers rigid, scanty, not elongating in fruit; receptacle with some bracts .....4. *B. sergiloides.*

B. Achenes 5-nerved, sometimes obscurely so.

Herbage glabrous or nearly so.
  Herbs; leaves resinous .....5. *B. douglasii.*
  Shrubs; leaves willow-like.
    Leaves dull green, not glutinous; involucres tawny.....6. *B. viminea.*
    Leaves lustrous green, glutinous; involucres stramineous.....7. *B. glutinosa.*
Herbage slightly pubescent; leaves linear; stems woody at base.
  Leaves acutely serrate, 1 to 4 in. long.....8. *B. plummerae.*
  Leaves entire, 3 to 6 lines long.....9. *B. brachyphylla.*

1. **B. pilulàris** DC. COYOTE BRUSH. CHAPARRAL BROOM. Fig. 943. Shrub 2 to 5 ft. high; branchlets angular; leaves broadly obovate or cuneate, coarsely or sinuately few-toothed, or occasionally entire, very obtuse, sessile, (¼ or) ½ to 1 in. long; heads short-cylindrical or ovoid, 2 or 3 lines long, solitary or commonly several in axillary and terminal clusters on the numerous leafy branchlets, the whole forming a leafy panicle; outer bracts of

involucre broadly, the inner narrowly oblong, sometimes denticulate at apex; pappus minutely scabrous, that of the pistillate flowers becoming 2½ to 5 lines long, that of the staminate flowers about ½ as long, in both (but more especially in the staminate) dilated at apex into a bent lanceolate appendage. — Common and usually gregarious on low hills, mountain slopes or on the coast sand dunes (especially in a prostrate form), 10 to 1500 ft.: throughout cismontane Cal.; n. to Ore. Aug.-Oct.

943. Baccharis pilularis DC.; *a*, pistillate branchlet x 1; *b*, staminate branchlet x 1; *c*, staminate fl. x 3; *d*, pistillate fl. x 3.

2. **B. emòryi** Gray. Loosely branched shrub 4 to 8 (or 12) ft. high, with long stems and with striate branchlets; lower leaves oblong, 3-nerved, often with 1 or several short broad teeth, 1 to 2 in. long, the upper linear, 1-nerved, entire; panicle large, the pistillate very showy in fruit, sparingly leafy, the heads few in glomerules terminating short branchlets; involucre campanulate or oblong, 3 lines long; bracts closely imbricated, bordered by a narrow scarious minutely ciliate margin, the outer oval, firm, the inner oblong or linear, thin; pappus of staminate flowers bearded at tip, of the pistillate flowers copious, in fruit 6 lines long.—Los Angeles and San Diego to the Colorado River; e. to Utah.

3. **B. saròthroìdes** Gray. Much-branched nearly leafless shrub 3 to 8 ft. high; panicle broom-like, composed of numerous slender branchlets and bearing only a few small leaves; branchlets 4-sided and strongly striate, bearing mostly 1, or at least few, heads; leaves few, linear or tapering to base, entire, 3 to 5 (or 10) lines long; sterile heads turbinate or hemispherical, 2 lines high; fruiting heads 4 to 5 lines high; involucral bracts chartaceous, oval, obtuse, rather closely imbricated, the few inner oblong or linear ones loosening at maturity; receptacle without bracts; achenes glabrous; pappus of pistillate flowers brownish, 3 to 4 lines long, not lanceolate-dilated at tip or very slightly.—Colorado Desert and mts. on its northern borders; w. to San Diego; e. to Ariz.; adjacent Mex. The dark green branches of the inflorescence often contrast vividly with the light tan color of the main stems. Var. PLURICÉPHALA Jepson n. var. Branchlets several-headed or even spicate; involucral bracts acute; achenes 1½ lines long.—Conchilla Mts. (Piñon Well, Jepson 6008, type).

4. **B. sérgiloìdes** Gray. SQUAW WATERWEED. Glabrous shrub 3 to 7 ft. high, the herbage very glutinous; branchlets slender, striate, mostly 4-sided; leaves obovate, entire, apiculate, drawn down to a narrow base, ½ to 1½ in. long; panicle usually nearly leafless, of numerous heads; heads oblong or widening a little upwards, 1½ to 2 lines high; involucral bracts oblong-ovate, acute, herbaceous in center and minutely puberulous, with scarious margins; receptacle with a few linear bracts amongst the flowers; pappus of pistillate flowers 2 lines long, not elongating in fruit, not dilated at tip; achenes glabrous.—Moist places in desert cañons: mts. on w. side Colorado Desert; e. Mohave Desert; Panamint Range; e. to Nev., Ariz. and Utah.

5. **B. douglásii** DC. Fig. 944. Stems suffrutescent at base, 4 to 5 ft. high, simple up to the terminal corymb; herbage very glutinous; leaves lanceolate and very acute, or the lower ovate-lanceolate, 3 to 4 in. long, serrulate, almost

944. Baccharis douglasii DC.; *a*, fl. branchlet x ½; *b*, long. sect. of head with fls. removed x 3; *c*, staminate fl. x 6; *d*, pistillate fl. x 6; *e*, achene and pappus x 6.

entire, 3 to 4 in. long; heads numerous in a terminal compound almost naked corymb; bracts of the involucre linear or lanceolate-linear with greenish center, the scarious margins erose-ciliate; receptacle broadly conical; pappus of pistillate flower short and soft, of the staminate clavellate at summit.—Moist lowlands: abundant in the salt marshes about San Francisco Bay, thence s. to coastal S. Cal.

6. **B. vimínea** DC. MULE FAT. Leafy shrub with many slender loosely branching stems, 4 to 8 ft. high; branches striate-angled; leaves rather dull green, lanceolate or oblong, acute at both ends, entire or sparingly denticulate, 1 to 3 in. long; main stem or branches of the inflorescence very leafy, the heads borne in rather close corymbose clusters disposed in a mostly loose and often interrupted panicle or compound corymb; heads narrowly bowl-shaped, 2 to 4 lines high; involucral bracts broadly lanceolate or the outer ones ovate, chartaceous with scarious margins, erose and mostly villous-ciliate; pappus-bristles of the sterile flowers nearly smooth, a little crinkle-bent at tip, those of the fertile flowers more slender, a little scabrous or nearly smooth, shorter than the sterile at flowering time, in fruit longer.—Flood beds of streams and rivers, Sierra Nevada foothills, Sacramento and Napa valleys southward to coastal S. Cal. July-Aug. The leaves of sterile shoots are often large (5½ in. long and 1 in. wide).

7. **B. glutinòsa** Pers. WATER-WALLY. Stems slender, erect or straggling, several in a cluster, 3 to 10 ft. high, ½ to 1 in. in diameter at base, woody at least below; branches striate; leaves bright lustrous green, lanceolate, remotely denticulate, acute at both ends, 3-nerved from the base, 1½ to 2½ (or "to 6") in. long; staminate heads 1½ lines high; fruiting heads 3 or 4 lines high, in a terminal compound corymb; bracts of the involucre oblong-lanceolate or the short outer ones ovate, stramineous, with narrow scarious margins, fimbrillate at tip; pappus-bristles minutely scabrous.—Along streams and in moist ground: Colorado Desert, w. to Riverside, n. through the Mohave Desert to Owens Valley; e. to Tex., s. to Mex.; Chile.

8. **B. plúmmerae** Gray. Stems slender, woody at base, forming rounded bushes 2 to 3 ft. high; herbage loosely puberulent, slightly viscid; leaves linear-oblong, obtuse, sharply serrate, sessile, 1 to 1½ in. long; panicles small or medium sized; staminate heads 2 to 2½ lines high; fertile heads 5 lines high; bracts linear-lanceolate, acute, scarious-margined; achenes puberulent.—Mountain cañons: Santa Inez Mts. to the Santa Monica Mts.; Santa Barbara Isls.

9. **B. brachyphýlla** Gray. Stems slender, much branched, woody at base, 2 to 3¼ ft. high, sparsely leaved; herbage puberulent; leaves linear, acute, entire, 3 to 6 lines long, the upper reduced and scale-like; heads 1½ to 2 (fruiting heads 4) lines high, loosely paniculate; involucral bracts oblong-lanceolate, the green midrib pubescent and with broad scarious margins; fruiting pappus sordid, 3 lines long; achenes sparingly puberulent.—S. San Diego Co.; e. to Ariz.

Tribe 5. **Inùleae.** Everlasting Tribe

Annual or perennial herbs. Herbage mostly white-woolly (except Pluchea). Leaves alternate (opposite in Psilocarphus), entire, or more or less dentate in Pluchea and Adenocaulon. Heads small; rays none. Bracts of the involucre frequently white or scarious. Pistillate flowers mostly with filiform corollas. Sterile flowers either perfect or staminate. Anthers caudate at base. Style-branches stigmatic to the unappendaged summit. Pappus capillary or none. (One species of no. 71 is a shrub.)

62. **MÍCROPUS** L.

Small floccose-woolly annuals. Leaves alternate, entire. Heads several-flowered, discoid, borne one in a place or somewhat clustered towards the ends of the branches. Receptacle convex. Bracts of the involucre open, scarious, surrounding the flower-bearing bracts of the receptacle. Bracts of the receptacle conduplicate or formed like a flat sac, rounded at apex, beaked on one side and open below the erect beak, almost concealed by the clothing of long loose wool, each one enclosing a pistillate flower; sterile flowers in the center mostly naked. Achenes gibbous, the corolla and style borne laterally, without pappus, remaining enclosed in the sac-like bracts which finally fall away from the receptacle. (Greek micros, small, and pous, foot, in allusion to the soft-woolly heads.)

Fruiting sacs with the opening not scarious-margined, the beak tipped with a narrow soft or scarious point; bracts of the involucre oblong.....1. *M. californicus.*

Fruiting sacs with the opening and the beak broadly scarious-winged, the wing thus forming a broad ovate or obovate membrane facing the staminate flowers in the center; bracts of the involucre orbicular.....
2. *M. amphibolus.*

1. **M. californicus** F. & M. Fig. 945. Stem slender, strictly erect, 4 to 13 in. high, commonly branched only at the summit; leaves linear-oblong to oblanceolate, acuminate, 2 to 9 lines long; receptacle low, with several scale-like processes; fruit-bearing bracts 4 to 6, at length indurated, the surrounding bracts of the involucre commonly 5, these orbicular or ovate, scarious, with a green spot in the center; staminate flowers about 3, the corolla filiform, but expanding somewhat toward the throat.—Very common on low hills or in valleys, 25 to 2700 ft.: throughout cismontane Cal.; n. to Ore. Apr.-May. Var. SUBVESTÌTUS Gray. Wool of the bracts short and wholly appressed.—Mt. Diablo; Oakland Hills; Belmont; Arroyo Grande; San Bernardino.

945. Micropus californicus F. & M.; *a*, habit x 1; *b*, fr. bract x 4; *c*, pistillate fl. x 4; *d*, staminate fl. x 4.

2. **M. amphíbolus** Gray. Resembling no. 1 but the fruiting bracts 9 or 10 and comparatively thin and soft; receptacle elevated or oblong; staminate flowers subtended by linear thin chaff-like bracts and with a pappus of few bristles.—Low hills, region of San Francisco Bay: Mt. Tamalpais; Laundry Farm, Oakland Hills; Walnut Creek. It is either very rare or, more probably, overlooked for M. californicus.

63. **FILÀGO** L.

Low woolly annuals with alternate entire leaves. Heads discoid, in small capitate clusters. Receptacle hemispherical or conical, its base bearing a series of concave or boat-shaped bracts, each enclosing a pistillate flower with filiform tubular corolla and destitute of pappus. Center or summit of receptacle bearing a cluster of fertile and sterile flowers and surrounded by a series of scarious or chaff-like bracts; central flowers with capillary pappus or the sterile sometimes without pappus. (Latin filum, a thread, in allusion to the cottony pubescence.)

Uppermost leaves conspicuously surpassing the heads.
Leaves subulate with broadish base; receptacle low, nearly flat.....1. *F. gallica.*
Leaves linear; receptacle somewhat obconic or convex.....2. *F. arizonica.*
Uppermost leaves scarcely longer than the heads.
Stems erect, simple or branched, 4 to 10 (or 15) in. high.....3. *F. californica.*
Stems depressed, diffusely more or less branched, 1 to 3 (or 4) in. high.....
4. *F. depressa.*

1. **F. gállica** L. Stem erect, branching or simple, 5 to 7 in. high; leaves subulate, ½ to 1 in. long, those involucrate to the heads straight, divaricate, and, in appearance, rigid but really soft; receptacle nearly flat; heads obconical, and somewhat 5-angled, 1¾ to 2 lines high; marginal achenes completely enclosed in the at length indurated base of the bract.—Nat. from Eur. on dry open or brushy slopes, 200 to 1200 ft.: Napa Range; Hydesville, Humboldt Co.; Ione; Milton; Whiteside, Mariposa Co. Apr.-May.

2. **F. arizònica** Gray. Stem branching from or above the base, erect or diffuse, 1½ to 6 in. high; herbage white-lanulose, the stems soon glabrate, the leaves more tardily; leaves linear, 3 to 11 lines long, the upper ones involucrate around and much exceeding the glomerules of heads; glomerules small, separated by elongated filiform internodes (½ to 2¾ in. long); marginal pistillate flowers 10 to 15, their bracts firm, ovate, open on the face; achenes oblanceolate, slightly curved, smooth.—Arid flats or valleys, 50 to 2000 ft.: Santa Catalina Isl.; San Diego; Riverside; Ojai Valley; Mohave Desert; e. to Ariz., s. to L. Cal. Apr.

946. Filago californica Nutt.; *a*, habit x ½; *b*, pistillate fl. with bract x 5; *c*, pistillate fl. of central cluster x 6; *d*, staminate fl. x 6.

3. **F. califórnica** Nutt. Fig. 946. Stem simple or branching, mostly erect, leafy throughout, 4 to 10 (or 15) in. high; herbage white-tomentulose, more or less glabrate, especially on the stems; leaves linear to oblanceolate, 3 to 10 lines long; heads ovate, 2 lines long; receptacle convex, rough or somewhat bur-like; marginal bracts 8 to 10, very woolly, deeply boat-shaped and somewhat incurved at apex, spreading stellately at maturity; inner bracts oblong, plane or merely concave; marginal achenes smooth; central achenes dotted with shining papillae.—Dry hills or flats, 100 to 3500 ft. mostly: Mendocino Co. to coastal S. Cal.; Sierra Nevada foothills from Butte Co. to Mariposa Co.; Ft. Tejon; w. side Colorado Desert; s. to L. Cal. Apr.-June.

4. **F. depréssa** Gray. Stem branching from the base, 1 to 4 in. high, the branches decumbent or ascending; herbage white-tomentulose or more or less glabrate; leaves oblong to narrowly obovate, 1½ to 4 lines long; heads 1 to 1½ lines high, borne in small glomerules, the glomerules subtended by short ovate or oblong leafy bracts and nearly equaling or sometimes exceeding the upper internodes; marginal pistillate flowers 5 or 6, their enclosing bracts woolly, nearly straight; achenes smooth, the marginal ones obovate, shining, the inner ones oblong or fusiform.—Sandy desert plains or mesas, 100 to 2000 ft.: Colorado Desert; Mohave Desert; Inyo Co. Apr.

64. **STYLOCLÌNE** Nutt.

Low floccose-woolly annuals with alternate entire leaves. Heads discoid, in small terminal clusters. Pistillate flowers enclosed in ovate boat-shaped bracts, these bracts borne on a slender column-like receptacle and with erect hyaline tip, the sac-like body loosely enclosing the achene; corolla filiform; pappus none. Staminate flowers few in the center, their bracts plane or

barely concave and their pappus caducous or none. (Greek stulos, a column, and kline, a bed, on account of the form of the receptacle.)

Bracts of the staminate (sterile) flowers thin, obtuse or merely acute, inconspicuous; fertile flowers many.
- Fruit-bearing bracts narrowly ovate, somewhat keeled and moderately woolly dorsally, the margins broadly scarious and continued upward so as to form an ovate plane wing on the ventral side ..... 1. *S. gnaphalioides.*
- Fruit-bearing bracts broadly ovate, somewhat obcompressed, heavily woolly on the back, the margins not winged but ending above in a conspicuous membranous ovate tip ..... 2. *S. micropoides.*

Bracts of the staminate (sterile) flowers thick, ovate-lanceolate, tapering into a conspicuous rigid hooked cusp; fertile flowers 5 to 9 ..... 3. *filaginea.*

1. **S. gnaphàlioìdes** Nutt. Fig. 947. Stems several to many from the base, ascending or erect, 1½ to 7 in. high; herbage loosely white-woolly; leaves broadly linear or the upper oblong, obtuse or rather bluntly apiculate, 2 to 4 lines long; fruit-bearing bracts many, ovate, slightly carinate and moderately woolly dorsally, each margin of the sac bearing a broad wing which is produced upward and thus forms a broadly ovate plane membrane on the ventral side; sterile flowers little shorter than their bracts, with rudimentary ovary and a pappus of few caducous bristles. — Dry grassy plains or mesas, 100 to 2000 ft.: w. side Colorado Desert; coastal S. Cal. and n. to Monterey Co. and the San Joaquin Valley. Apr.

947. Stylocline gnaphalioides Nutt.; *a*, habit x ¾; *b*, fertile or outer bract of receptacle, enclosing pist. fl. x 6; *c*, inner bract x 6; *d*, stam. fl. x 6; *e*, pist. fl. x 6.

2. **S. micropoìdes** Gray. Stem branched at or near the base, the branches erect or diffuse, 1 to 3 in. high; leaves linear to oblong-oblanceolate, 3 to 8 lines long; fruit-bearing bracts numerous, broadly ovate, somewhat obcompressed, heavily woolly on the back (thus resembling pellets of wool), the margins not scarious-winged, ending above in a rather conspicuous ovate membranous tip; sterile flowers naked or subtended by thin glabrous or weakly hairy scales, with a pappus of 2, 3 or 4 caducous bristles.—Sandy river flats or rocky hills, 250 to 7400 ft.: ne. Colorado Desert; Mohave Desert; Inyo Co.; e. to N. Mex., s. to Mex. Apr.-May.

3. **S. filagínea** Gray. Stem branched at or above the base, erect or ascending, 2 to 4 in. high; herbage canescent with fine appressed wool which is later flocculent; leaves narrowly linear or narrowly oblanceolate, 3 to 7 lines long, those involucrate to the heads broader; fertile flowers 5 to 9, their bracts boat-shaped, firm except at the hyaline tip, smaller than the 5 empty bracts which surround the sterile flowers in the center; empty bracts somewhat coriaceous, tapering into a rigid incurved hooked cusp, persistent, and at length stellately spreading.—Dry often brushy slopes, 800 to 2000 ft.: Coast Ranges from San Luis Obispo Co. to Mendocino and w. Colusa Cos.; Mariposa Co. foothills. Apr.-May. Var. DEPRÉSSA Jepson n. var. Much branched from the base, the stems stout, prostrate, forming a mat 1 to 4 in. broad.—Siskiyou Co.; w. Tehama Co. (Crane Creek, Jepson, type); Priest Valley, Monterey Co.

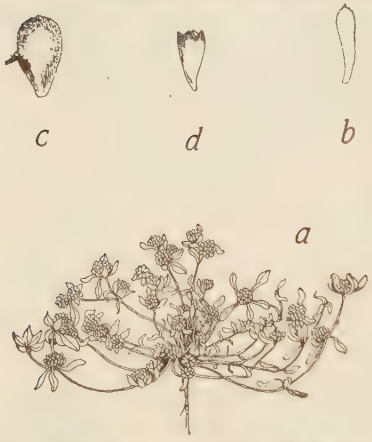
65. **PSILOCÁRPHUS** Nutt.

Low or prostrate white-woolly annuals. Leaves opposite, entire, the uppermost involucrate around the small sessile globose heads, which are solitary in the forks or at the ends of the branches, or some clustered. Heads globose,

discoid. Bracts all of one kind, clothed with soft wool, crowded on the small globose receptacle, each bract sac-like, half-obcordate or obovate in side view, hooded and rounded at the top with the apex introrse (turned downward and inward) and beaked by a hyaline appendage or scale. Flowers unisexual; pistillate flowers loosely enclosed in the sac-like bracts, with filiform corollas; staminate flowers few, occupying the center of the head and naked, that is, destitute of enclosing or other bracts. Achenes straight or slightly curved. Pappus none. (Greek psilos, bare, and karphos, chaff.)

Leaves tapering below; heads numerous, covered with rather close wool.
Plants prostrate, matted; leaves 3 to 8 lines long, rather abruptly narrowed toward base ..... 1. *P. tenellus.*
Plants erect or diffusely branched; leaves ½ to 1⅜ in. long, gradually narrowed toward base ..... 2. *P. oreganus.*
Leaves not tapering below; heads rather few, covered with very loose wool.
Heads nearly concealed by upper leaves ..... 3. *P. globiferus.*
Heads not concealed by upper leaves ..... 4. *P. brevissimus.*

1. **P. tenéllus** Nutt. Fig. 948. Plants prostrate, the forking stems forming a dense mat 2 to 10 in. broad; leaves spatulate to oblanceolate, mucronate, 3 to 8 lines long; heads numerous, 2 lines broad; achenes oblong or slightly broader toward the summit, about ⅓ line long.—Valleys and low hills, 25 to 3400 ft.: coastal S. Cal.; Coast Ranges; Sierra Nevada foothills from Mariposa Co. n.; Sacramento Valley; n. to Wash. May-June.



948. Psilocarphus tenellus Nutt.; *a*, habit x ⅔; *b*, leaf x ⅔; *c*, involucral bract enclosing pistillate fl. x 4; *d*, staminate corolla x 6⅔.

2. **P. oregánus** Nutt. Stem diffusely branched from base, the few to many branches slender, erect or spreading, 2 to 5 in. long; herbage covered with a close tomentum; leaves spatulate, mostly apiculate, ½ to 1⅜ in. long; heads 2 to 2½ lines broad, solitary or in clusters of 2 or 3 in the forks and at ends of the branches.—Beds of former vernal pools, 25 to 500 ft.: Coast Ranges; lower San Joaquin Valley; Sacramento Valley; n. to Ore. May.

3. **P. globíferus** Nutt. Stem either simple or branching, prostrate or ascending, 1 to 4 in. long; herbage loosely tomentose; leaves linear, 2 to 7 lines long; heads 3 lines broad, in terminal clusters or scattered along the branches or in the forks, more or less concealed by the whorl of subtending leafy bracts; achenes elliptic-oblong.—Low places in fields where water has stood, 50 to 3000 ft. mostly: coastal S. Cal.; Great Valley; e. of the Sierra Nevada from e. Nevada Co. to Modoc Co.

4. **P. brevíssimus** Nutt. Dwarfish, the stems several to many from the base but mostly simple, 1 to 3 in. long; leaves obspatulate, obtuse or merely acute, 4 to 6 lines long, the involucrate ones partly concealing the heads; heads comparatively few, 4 to 5 lines broad, more loosely woolly than in P. oreganus; staminate flowers about 7 or 8; achene cylindrical or slightly clavate, less than 1 line long.—Summer beds of vernal pools: San Luis Obispo Co. to Sacramento Valley; n. to Wash. May-June.

66. **ÈVAX** Gaertn.

Dwarf rigid densely woolly annuals. Leaves alternate, entire. Heads discoid, solitary in the axils or crowded in dense terminal clusters. Bracts of the involucre very closely imbricated, covering but not enclosing the pistillate flowers and forming a short-cylindric head, the receptacle produced upward as a slender or spike-like column tipped with a cup-like whorl of 5 bracts at summit, the cup bearing 2, 3 or 4 staminate flowers. Bracts of the

involucre and of the pistillate flowers becoming hardened, persistent, the upper or sterile bracts deciduous. Pistillate flowers with filiform corollas. Pappus none. (An Arabian chief who wrote to Emperor Nero about simples.)

Bracts of pistillate flowers chartaceous, becoming coriaceous, persistent; receptacle columnar or cylindric; leaves narrowed to a very slender petiole.
Heads mostly scattered; receptacle elongated or slenderly cylindric..... 1. *E. sparsiflora.*
Heads in terminal clusters; receptacle thick-columnar..2. *E. caulescens.*
Bracts of pistillate flowers scarious, at maturity deciduous; receptacle low hemispheric or merely convex; heads in terminal clusters; leaves sessile by a broad base.....3. *E. multicaulis.*

1. **E. sparsiflòra** Jepson. Fig. 949. Stem erect, 1 to 4 in. high, simple or commonly branching from the base, the heads in the axils, scattered along the branches or slightly glomerate at the ends of the branches; leaves spatulate, narrowed to a very slender petiole, 3 to 8 lines long; bracts of the receptacle woolly on back and rather densely long-hirsute at base, especially the upper; staminate flowers in center about 4.—Dry adobe or sometimes sandy soil in the hills, 10 to 2000 ft.: Coast Ranges from Humboldt Co. to San Luis Obispo Co. May. Var. BREVIFÓLIA Jepson n. comb. Depressed and rosulate, or with stems 1 in. high; leaves small, short-petioled, about ¼ to ½ in. long.—Humboldt and Napa Cos.; Amador Co. (E. caulescens vars. brevifolia and minima Gray.)

949. Evax sparsiflora Jepson; *a*, habit x ⅔; *b*, head x 7; *c*, section of head x 7; *d*, cluster of staminate flowers in terminal cup x 7; *e*, involucral bract x 7; *f*, pistillate flower x 7.

950. Evax caulescens Gray; *a*, habit x ¾; *b*, central cluster of stam. fls. with subtending circle of bracts x 4; *c*, long. sect. of head, the bracts with pistillate fls. in their axils, the terminal cluster staminate x 4; *d*, bract x 4; *e*, staminate fl. x 8; *f*, pistillate fl. x 8.

2. **E. caulèscens** Gray. Fig. 950. Stems 1 to several from the base, simple, 1 to 8 in. high; heads all crowded in a very dense terminal cluster, the cluster hemispherical, 6 to 9 lines broad and surrounded by a whorl of many leaves, these leaves spatulate-obovate, 6 to 12 lines long, narrowed to a petiole ¾ to 1 in. long; cauline leaves similar, 3 to 5 lines long, on petioles ¾ to 1 in. long.—Dry summer beds of vernal pools, 10 to 300 ft.: Sacramento Valley; Napa Valley. (E. involucrata Greene.) Var. HÙMILIS Jepson. One to 2 in. high, the heads crowded on the short central stem or at the ends of the very short horizontal branches (none in the axils), the close clusters subtended by rosulately arranged leaves.—Antioch.

3. **E. multicáulis** DC. Stems several from the base, diffuse, 2 to 4 in.

long; leaves spatulate to oblong-spatulate, sessile by a broad base, 3 to 6 lines long; heads in terminal glomerules, the glomerules more or less concealed by the bract-like upper leaves; receptacle low-hemispheric; bracts of the pistillate flowers linear, narrowed a little towards the base, chartaceous, with narrow scarious margins, glabrous except at the densely implexed-woolly apex; bracts of the staminate flowers spatulate, woolly on the back. —Mohave Desert; e. to Ariz.

67. **ADENOCÁULON** Hook.

Perennial herbs. Stems slender, leafy only at base, bearing above a panicle of small and few heads of whitish flowers, the upper portion of the stem and the panicle beset with small glands. Leaves alternate, broad, petioled, green and early glabrate above, white-woolly beneath. Heads of few disk-flowers; ray-flowers none. Marginal flowers of the head pistillate and fertile, the central perfect, sterile and with undivided style; corollas of both sorts tubular. Bracts of the involucre 5 to 9, equal, in a single row, not scarious, reflexed in fruit, at length deciduous. Receptacle flat, naked. Mature achenes much elongated and clavate, covered above with stalked glands. Pappus none. (Greek adenos, a gland, and kaulon, a stem.)

951. Adenocaulon bicolor Hook.; *a*, *b*, habit x ¼; *c*, head of fls., the central ones perfect, the 3 marginal ones pistillate x 2; *d*, staminate fl. x 5; *e*, pistillate fl. x 2.

1. **A. bìcolor** Hook. Fig. 951. Stems 1½ to 2¼ ft. high, the lower portion floccose-woolly; leaves deltoid-ovate, cordate at the base, sinuate-dentate, 1½ to mostly 3 or 4 in. long and as broad or broader; petioles margined; staminate flowers about 10, their corollas 4-lobed; pistillate flowers 3, their corollas as if 2-lipped, the lower lobe turned down, the other lobes approximate-hooded over style; achenes 3 to 3½ lines long, much longer than bracts of the involucre. —Moist or shady woods, 500 to 5500 ft.: along the coast from Santa Cruz Co. to Humboldt Co.; Sierra Nevada from Tulare Co. to Shasta Co.; n. to B. C., e. to Lake Huron. June.

68. **GNAPHÀLIUM** L. Cudweed

Woolly herbs with entire sessile or decurrent leaves. Heads discoid, white, yellowish or rose-tinted, disposed in panicles, corymbs, or spikes. Receptacle flat or convex, naked. Bracts of involucre scarious, imbricated. Pistillate flowers in several series with filiform corollas. Central flowers perfect, with tubular 5-lobed corollas. Pappus a single series of capillary bristles. (Greek gnaphalon, a lock of wool, these plants floccose-woolly.)

Pappus-bristles united at base, falling away in a ring; inflorescence spike-like; leaves white-woolly beneath, green above .....1. *G. purpureum.*
Pappus-bristles not united at base, falling separately; inflorescence corymbose, paniculate or cymose.
Involucre imbedded in loose wool, its bracts with scarious tips, rather inconspicuous; low branching annual .....2. *G. palustre.*
Involucre woolly only at base, its bracts mainly scarious or silvery, conspicuous; mostly tall biennials or perennials, or nos. 4 and 9 annual or biennial.
Herbage in age becoming green (at least the upper surface of the leaves), more or less glandular.

Inflorescence corymbose; bracts pearly white; herbage balsamic-scented.... 3. *G. decurrens.*
Inflorescence paniculate or cymose; bracts white or rose-tinged.
Root annual or biennial; heads loosely paniculate; involucre turbinate. 4. *G. ramosissimum.*
Root woody perennial; heads in close cymes; involucre campanulate.
Stem 1 to 2 ft. high, mostly simple; leaves narrowly linear, short-decurrent at base .....5. *G. leucocephalum.*
Stems 2 to 3 ft. high, branching; leaves oblong or broadly linear (or the upper lanceolate), broadly auriculate at base.... 6. *G. bicolor.*
Herbage persistently woolly, not glandular or scarcely so.
Involucre white; inflorescence paniculate or cymose.
Leaves linear (or the lower narrowly spatulate), slightly decurrent; herbage odorless .....7. *G. microcephalum.*
Leaves broader, spatulate to lanceolate, not at all decurrent; herbage fragrant .....8. *G. beneolens.*
Involucre greenish-yellowish, becoming rusty; heads in capitate clusters or the clusters somewhat open-paniculate.....9. *G. chilense.*

1. **G. purpùreum** L. PURPLE CUDWEED. Fig. 952. Stem commonly simple and erect from a slightly decumbent base, 4 to 12 in. high, arising from an annual or biennial root; herbage canescent with a close dense coating of white wool, the upper surface of the leaves usually early glabrate; leaves broadly spatulate, obtuse, 1 to 3 in. long and 2½ to 7½ lines wide; heads crowded in a spike-like inflorescence which is dense and oblong, or more elongated and more or less interrupted; heads 2 lines long; involucre brownish or purplish; achenes sparsely scabrous.—Open ground along the coast, 50 to 1600 ft.: San Diego Co. to Humboldt Co.; n. to B. C., thence e. to Mass., thence to Tex. May.

952. Gnaphalium purpureum L.; *a*, habit x ½; *b*, head x 3½; *c*, pistillate fl. x 5; *d*, staminate fl. x 5.

2. **G. palústre** Nutt. LOWLAND CUDWEED. Fig. 953. Annual; stem commonly branching at the base, the branches erect or ascending, 3 to 8 in. high; herbage loosely floccose with long wool, more or less deciduous from the leaves; leaves spatulate or linear-spatulate, 5 to 12 lines long, a few about the clusters of heads oblong or lanceolate; heads in small clusters at the ends of the branchlets, 1 to 1½ lines high; bracts of the involucre imbedded in loose wool, linear, with white or chartaceous obtuse often denticulate tips.—Stream beds or low places in valleys, 10 to 4000 ft.: common throughout cismontane Cal.; n. to B. C., e. to Wyo. and N. Mex. July-Aug. Var. NÁNUM Jepson. Dwarf, 1 to 2½ in high; bracts acute.—Dry openly wooded hills, Napa Range. June-Oct.

3. **G. decúrrens** Ives var. **califórnicum** Gray. CALIFORNIA EVERLASTING. Biennial; stem stoutish, 2 to 3 ft. high, corymbosely branched at summit, the branches bearing glomerules of large heads and forming a broad and somewhat flat-topped inflorescence; herbage soon becoming green and more or less glabrate (except on the under surface of the leaves), at maturity glandular and balsamic-scented; lower leaves oblong (⅓ to 1 in. broad and 2 to 5 in. long), diminishing in size upwards and becoming lanceolate, all obviously decurrent; heads roundish or broad, 2 to 3 lines high or slightly more, the involucral bracts white or in age rusty-tinged.—Dry wooded hills, 100 to 2000 ft.: Humboldt Co. to San Luis Obispo Co.; s. to coastal S. Cal. May-June.

953. Gnaphalium palustre Nutt.; *a*, habit x ½; *b*, head x 3½; *c*, staminate fl. x 7; *d*, pistillate fl. x 7.

4. **G. ramosíssimum** Nutt. PINK EVERLASTING. Stems 1 to several from a biennial root, erect, 2 to 5 ft. high, ending above in a much-branched panicle; herbage greenish, a little glandular, sweet-scented, the stems arachnoid, the leaves finely pubescent; leaves linear-lanceolate, attenuate, ¾ to 2½ in. long; panicle narrow or virgate, or sometimes very broad, ¼ to 1¼ ft. long; involucres narrowly ovate or turbinate, reddish or pinkish, 2 lines high, their bracts ovate, obtuse or acute.—Wooded hills along the coast, 100 to 1200 ft.: Marin and Alameda Cos. to San Gabriel Mts.

5. **G. leucocéphalum** Gray. Stem erect, strict, mostly simple, very leafy, 1 to 2 ft. high, from a perennial root; herbage very white with close wool, the upper side of the leaves green, rather densely glandular-pubescent; leaves narrowly linear, attenuate, commonly erect, 1 to 2 in. long, 1 to 2 lines wide, little broader at the short-decurrent base; heads broadly campanulate, disposed in a cyme, 3 to 12 in. broad; bracts of the involucre ovate, obtuse, thin-papery, much imbricated, pure pearly white.—Coastal S. Cal., 400 to 1200 ft.: Hollywood; Pasadena; e. to Tex.

6. **G. bícolor** Bioletti. Stem stout, erect, freely branching, arising from a perennial root, 2 to 3 ft. high; branches terminating in a compact or almost capitate cyme; herbage white-tomentose, the tomentum deciduous from the upper side of the leaves, the leaves thus green above and white beneath; leaves oblong to linear or lanceolate, closely sessile by a broad auricled base, ½ to 1¾ in. long, the margins revolute and a little undulate; involucres campanulate, 2 to 2½ lines high, their bracts white or sordid, ovate, obtuse, the inner oblong, acute, often greenish.—Sandy fields or dry hills, 25 to 5500 ft.: coastal S. Cal.; n. to Monterey and Tulare Cos.; s. to L. Cal. Mar.-Apr.

7. **G. microcéphalum** Nutt. WHITE EVERLASTING. Stems 1 to several from a biennial root, erect, 1¼ to 2¼ ft. high, ending above in a much branched panicle; herbage more or less densely white-lanate, especially when young, the wool persistent; leaves narrowly linear, acute, mucronate, 1½ to 3 in. long; panicle often narrow and elongated, sometimes broad, 4 to 12 in. long; heads oblong or cylindric, 2 to 2½ lines high, disposed in rather small glomerules at the ends of the branchlets; bracts of the involucre ovate or oblong, obtuse, the innermost linear, bright white.—Wooded mountain slopes, 500 to 5300 ft.: throughout cismontane Cal.; n. to Ore. Aug.-Sept.

8. **G. benèolens** Dav. Stem erect, simple, arising from a perennial root, 2 to 2½ ft. high, ending above in a much-branched panicle; herbage persistently white-woolly, not glandular; leaves spatulate-oblong to linear or lanceolate, 1 to 3 in. long; heads in small glomerules, the glomerules many, borne on loose spreading or divergent branchlets; involucres turbinate or ovatish, white, very woolly at base, 2 lines long, their bracts thin, oblong, obtuse or acute, the inner often apiculate.—Dry ground, 100 to 3000 ft., coastal S. Cal.: Santa Cruz Isl.; Ballona Marshes; San Gabriel Mts.; Santa Ana Cañon, Orange Co.; e. to Tex. May-Sept.

9. **G. chilense** Spreng. COTTON-BATTING PLANT. Annual or biennial; stems several, erect from a decumbent base (or single and wholly erect), stout, ½ to 2½ ft. high, often densely clothed with leaves; leaves narrowly spatulate

or the uppermost linear or lanceolate, ¾ to 1¼ in. long, the short decurrent bases rather broad and somewhat auricle-like; heads 3 lines wide and high, numerous in a large close glomerule terminating the main stem, or in several glomerules at the ends of the branches of the more or less open panicle; involucres with a greenish yellowish tinge.—Open ground in valleys or on low hills, 10 to 5000 ft.: throughout cismontane Cal.; e. to Tex. May-Aug. Var. CONFERTIFÒLIUM Greene. Stem stout, low, densely clothed with linear leaves up to the sessile cluster of heads.—With the species.

69. **ANÁPHALIS** DC. EVERLASTING

Perennial herbs with simple erect equably leafy stems. Leaves green above, closely woolly beneath. Heads disposed in a compound corymb. Bracts of the involucre numerous, pearly white and scarious, imbricated in several series, radiating in age. Flowers yellow, polygamo-dioecious; staminate heads with only staminate flowers; pistillate heads with pistillate flowers and a few central staminate flowers; staminate flowers with a tubular 5-lobed corolla with spreading limb and an included 2-cleft style; pistillate flowers with filiform toothed corolla and exserted 2-cleft style; pistillate flowers fertile, staminate flowers sterile. Pappus as in Gnaphalium. (Ancient Greek name of some "Everlasting.")

954. Anaphalis margaritacea B. & H.; *a*, fl. branchlet x ⅔; *b*, pistillate fl. x 4; *c*, staminate fl. x 4.

1. **A. márgaritàcea** (L.) B. & H. PEARLY EVERLASTING. Fig. 954. Stems several from the base, 1 to 2 ft. high; leaves broadly to narrowly lanceolate, sessile, with revolute margin, 2 to 5 in. long; corymb 1½ to 6 in. broad.—Open woods: Coast Ranges, 20 to 4000 ft., from Monterey Co. to Siskiyou Co.; Sierra Nevada, 4000 to 6500 ft., from Eldorado Co. n.; e. to Penn. and Newf., n. to Alas.; Asia. July-Sept. Var. OCCIDENTÀLIS Greene. Leaves sessile by a broad auriculate-clasping base.—Oakland Hills; San Francisco; s. Sierra Nevada from Mariposa Co. to Fresno Co.

70. **ANTENNÀRIA** Gaertn.

Low tomentose perennial herbs. Leaves mostly in basal tufts, the cauline ones alternate, all entire. Heads dioecious, borne in small capitate, corymbose or thyrsoid cymes, rarely solitary. Involucral bracts scarious, imbricated in several series, the outer shorter, usually woolly. Receptacle convex or flattish, naked. Staminate flowers with filiform corolla, entire or merely notched style and a scanty pappus of clavellate bristles. Pistillate flowers with tubular 5-toothed corolla, 2-cleft often crimson style and copious pappus of capillary naked bristles united at base. (Latin, the sterile pappus fancifully likened to insect antennae.)

Heads solitary, terminating short stems or sessile among the basal leaves; caespitose plants ½ to 1½ in. high; pappus-bristles of sterile flowers hardly thickened at apex.... 1. *A. dimorpha.*

Heads in clusters terminating short or elongated stems; pappus-bristles of sterile flowers with thickened or dilated tips.

Basal leaves roundish-ovate to obovate-spatulate, ¾ to 1 in. wide, the tomentum early deciduous from their upper surface.....2. *A. plantaginifolia.*

Basal leaves spatulate to oblanceolate, much narrower, not more than ½ in. wide, the upper surface rarely early glabrous.

Tips of involucral bracts green to pale brown (or in staminate heads whitish).

Heads in a cymose cluster (sometimes solitary); tomentum felt-like, extending well up onto involucre.....3. *A. alpina.*

Heads paniculate; tomentum silky, extending only to base of involucre..... 4. *A. microcephala.*

Tips of involucral bracts pearly white to deep pink or red.

Tomentum extending only to base of involucre; tips of involucral bracts white.

Lower leaves spatulate, the upper oblanceolate; staminate heads 2½ lines wide ..... 5. *A. argentea.*
Lower leaves narrowly oblanceolate-spatulate, the upper linear; staminate heads 1½ lines wide ..... 6. *A. luzuloides.*
Tomentum extending well up onto involucre; tips of involucral bracts white to rose-color or red.
Stems sparsely leafy above; inflorescence cymose ..... 7. *A. dioica.*
Stems densely leafy above; inflorescence paniculate (sometimes somewhat spicate) ..... 8. *A. geyeri.*

1. **A. dimórpha** J. & G. Plants mat-like, the stem freely branched and bearing rosulate clusters of leaves, the heads solitary, sessile in the rosettes or terminal on erect branches ½ to 1½ in. high; herbage white-woolly; leaves spatulate to linear-oblanceolate, 3 to 8 lines long; involucres of the staminate heads about 2¾ lines high, their bracts brownish or bluish, obtuse; involucres of the pistillate heads enlarging to 3 to 4½ lines high, their bracts paler, the innermost narrow and attenuate into a hyaline tip; fruiting pappus of pistillate flowers twice as long as involucre.—Montane, 6000 to 8800 ft.: San Antonio Mts.; Mt. Pinos; Sierra Nevada from Tulare Co. to Modoc Co.; Siskiyou Co.; n. to B. C., e. to Rocky Mts. Mar.-July.

2. **A. plantáginifòlia** Hook. Stem scape-like, ½ to 1½ ft. high, arising from stolons terminating slender rootstocks, bearing few small leaves (the leaves chiefly basal), and ending above in a small cyme; basal leaves roundish ovate to obovate or spatulate, glabrate and green above, silvery-lanate beneath, mostly 3 to 5-nerved, 1 to 2 in. long, the petioles ½ to ¾ in. long; cyme consisting of 3 to 5 clusters of heads; involucres very woolly at base; inner bracts of the staminate heads with oblong obtuse tips, those of the pistillate heads with narrow acute tips; achenes minutely glandular.—Montane woods, 4000 ft.: Siskiyou Co.; n. to B. C., e. to Tex. June.

3. **A. alpina** Gaertn. Stems several to many, 1 to 6 in. high, erect or ascending from the branched root-crown, the short basal shoots leafy-tufted and thus forming caespitose plants; herbage white-tomentose; basal leaves spatulate to oblanceolate, 4 to 9 lines long; heads 3 to 6 in a dense terminal cluster; involucre 2 to 3 lines high, livid-brownish or dusky; inner bracts of the staminate heads with whitish oblong tips, of the pistillate heads wholly livid and scarious and acutish to acuminate; pappus-bristles of staminate heads moderately dilated, often spinulose-serrate; achenes glandular.—Alpine, 8000 to 12,500 ft.: Kaweah Peaks to Mt. Dana, Mt. Tallac, Lassen Peak and Mt. Shasta; n. to Alas., e. to Lab. and Col. July-Sept. Var. MÈDIA Jepson n. comb. Densely caespitose, 1 to 4 in. high; leaves 2 to 4 lines long; involucre about 2 lines high; bracts green or greenish-brown, those of the pistillate heads oblong or linear-oblong, those of the staminate heads oval; pappus-bristles of staminate heads more broadly dilated, often remotely dentate above.—Montane, 9200 to 11,400 ft.: Sierra Nevada; San Bernardino Mts. Aug. (A. media Greene. A. densa Greene.) Var. SCÀBRA Jepson n. comb. Plant 1 in. high; herbage at first with a dense soft woolly coat, the tomentum promptly deciduous and exposing a dense glandular-scabrous green indument.—Alpine, 12,500 ft., White Mts. July. (A. scabra Greene.)

4. **A. microcéphala** Gray. Stems simple, slender, erect, 3 to 7 in. high, more or less leafy, especially below, arising from branching rootstocks, ending above in a small panicle; herbage silvery-lanate; leaves narrowly oblanceolate to oblanceolate-spatulate, narrowed to a more or less margined petiole, the whole ½ to 2½ in. long, the upper cauline ones much reduced; panicle ½ to 1¼ in. long; heads 1¾ to 2¼ lines high, on peduncles ½ to 1 line long, or some sessile in clusters; involucres wholly glabrous, their bracts light brown or dull reddish; bristles of staminate pappus with dilated tips.—Dry gravelly places, eastern slopes or eastern mountain valleys of the Sierra Nevada, 5000 to 5500 ft.: e. Nevada Co.; Sierra Co.; Plumas Co.; e. to Nev. June-July.

5. **A. argéntea** Benth. Stems erect from the branched root-crown, 8 to 16 in. high, mostly naked above, scantily leafy at middle or below, the leaves chiefly basal; herbage densely white-tomentose, the leaves sometimes sparsely so above, the tomentum extending only to base of involucres; lower leaves spatulate or narrowly obovate, gradually narrowed to a short or long petiole,

the whole ¾ to 2¾ in. long, the veins prominent in spite of the thick tomentum; upper cauline leaves oblanceolate or linear-oblanceolate, acute, the uppermost reduced to mere bracts; heads 2 to 2½ lines high, numerous in a compound thyrsoid or corymbose cyme ¾ to 1¾ in. broad; involucres white, the pistillate ones turbinate, becoming campanulate, with the innermost bracts acutish to acuminate, the staminate ones campanulate with the inner bracts ovate, obtuse or acutish, ivory-white, chartaceous; tips of staminate pappus much dilated, obtuse.—Montane, 3500 to 6700 ft.: Sierra Nevada from Fresno Co. to Modoc Co., North Coast Ranges from n. Lake Co. to Siskiyou Co. June-July.

6. **A. lùzuloìdes** T. & G. Stems slender, erect from a slightly decumbent base, arising from a branched root-crown, 5 to 12 in. high; herbage silky lanate; leaves narrowly linear, or linear-oblanceolate, or oblanceolate-spatulate, drawn down to a narrow base, the whole ¾ to 2 in. long; small uppermost leaves linear-subulate; heads small, 2 to 3 lines high, several to many in a compact cyme ½ to 1¼ in. broad; involucres glabrous nearly or quite to the base, the inner bracts in the pistillate heads obtuse; achenes glandular, the spatulate petaloid tips of the pistillate pappus obtuse.—Montane, 5000 to 6000 ft.: Plumas Co. to Modoc Co.; n. to B. C., e. to Wyo. May.

7. **A. dioìca** Gaertn. Stems erect, sparsely leafy, 2 to 12 in. high, arising from branching stolons or rootstocks tipped by leafy tufts and thus forming broad mats; herbage tomentose, the tomentum extending well up onto the involucre; heads 2½ lines high, nearly as broad, few to many in a dense or globose cymose cluster; leaves ½ to 1⅛ in. long, the basal obovate to spatulate, obtuse or acute, the cauline leaves linear-oblanceolate; involucral bracts obtuse or acute, the tips chartaceous, rose-color or white; achenes smooth and glabrous, sometimes minutely glandular.—Montane, 5100 to 9300 ft.: San Jacinto and San Bernardino mountains; Sierra Nevada from Tulare Co. to Nevada Co.; Mt. Shasta; n. to Alas., e. to Lab. and N. Mex. July-Aug. Var. RÒSEA Eat. Basal leaves narrowly spatulate; involucral bracts pale pink to deep rose-pink.—Montane, 4000 to 11,000 ft.: Sierra Nevada from Tulare Co. to Modoc Co.; Mt. Shasta; w. Siskiyou Co. June-Aug. Var. CONGÉSTA DC. Leaves in a rosulate tuft on the ends of the prostrate stems, the heads sessile in the rosette.—Sierra Nevada; e. to Col. Var. CORYMBÒSA Jepson n. comb. Herbage lightly tomentose; basal leaves oblanceolate, cuspidately mucronate, the cauline linear; bracts with a brownish spot at the middle; bracts of staminate heads somewhat erose at apex.—Mariposa Co. (A. corymbosa E. Nels.) Var. MARGINÀTA Jepson n. comb. Older leaves green and glabrate above, the dense tomentum below showing as a narrow white margin; involucrate bracts of pistillate heads greenish with white tips, the long inner ones very narrow and acute, those of the staminate heads broadly obovate, erose, brownish at base, the tips pure white.—Montane, 7200 to 11,000 ft.: Sierra Nevada; San Bernardino Mts. (A. marginata Greene.) Var. KERNÉNSIS Jepson n. var. Densely caespitose, 1 to 4 in. high; herbage tomentose; basal leaves spatulate to oblanceolate, 3 lines long, sometimes glabrate above.—High montane, 8500 to 10,500 ft., upper Kern River: Denels Peak; Volcano Mdws.; Siberian Pass (Hall & Babcock 5473, type). July.

8. **A. géyeri** Gray. Stems several, erect, leafy to the inflorescence, 3 to 5 in. high, arising from a branched woody base; herbage densely lanate; leaves spatulate to oblanceolate, 6 to 8 lines long; heads 2½ to 4 lines high, somewhat spicate or paniculate, the inflorescence 3 to 12 lines long; involucres very woolly, only the inner bracts glabrous; bracts with conspicuous rose-purple or sometimes ivory-white tips, those of the staminate heads narrow, acute, those of the pistillate heads obtuse; staminate pappus with moderately clavate bristles, usually surpassed by the bracts.—Montane, 4000 to 6000 ft.: Eldorado Co. to Modoc Co.; Mt. Shasta; n. to Wash. June-Aug.

71. PLÙCHEA Cass.

Tall leafy herbs or shrubs. Heads numerous, hemispheric, clustered in terminal corymb-like cymes, consisting of many purplish disk-flowers and no ray-flowers. Marginal flowers of the head pistillate and fertile, with tubular-filiform truncate or 2 to 4-toothed corollas shorter than the 2-cleft style;

central flowers few, perfect but sterile, with tubular 5-cleft corollas and entire or bifid style. Involucre imbricated. Receptacle flat, naked. Achenes grooved. Pappus a single series of capillary bristles. (The Abbe N. A. Pluche, 18th century naturalist, of Paris.)

Herb; leaves and stems glandular.....1. *P. camphorata.*
Shrub; herbage silvery-canescent.....2. *P. sericea.*

1. **P. camphoráta** (L.) DC. SALT-MARSH FLEABANE. Annual; stems stoutish, erect, branching above, 1¼ to 2½ ft. high; herbage glandular-puberulent; leaves oblong-ovate or lanceolate, glandular-dentate, short-petioled or the upper sessile, the larger 3 to 5 in. long; heads 2½ lines high, rarely leafy-bracted, in corymb-like cymes; bracts of the involucre ovate-lanceolate; achenes pubescent.—Salt marshes in low valleys: region of San Francisco Bay; Great Valley; coastal S. Cal.; Atlantic coast. Aug.-Oct.

955. Pluchea sericea Cov.; *a*, fl. branchlet x ⅔; *b*, perfect flower x 4; *c*, pistillate flower x 4.

2. **P. sericea** (Nutt.) Cov. ARROWWEED. Fig. 955. Slender erect shrub 3 to 10 ft. high with silvery-silky herbage; leaves linear to lanceolate, entire, acute at both ends, sessile, ½ to 1¾ in. long; heads 3 to 4 lines high; outer involucral bracts ovate, coriaceous, the inner linear, much thinner; pappus-bristles of the sterile flowers geniculate-crinkly and slightly dilated at tip, those of the fertile obscurely if at all so.—River bottoms, 100 to 2200 ft.: coastal S. Cal.; Colorado and Mohave deserts; Inyo Co.; immensely abundant along the Colorado River bottoms from Needles to Yuma; s. to L. Cal., e. to Tex. Also called Mock Willow. (Tessaria borealis T. & G.)

TRIBE 6. **Heliántheae.** SUNFLOWER TRIBE

Herbs (or shrubs) with mostly opposite or basal leaves and with balsamic-resinous juice. Rays present, almost always showy. Bracts of the involucre herbaceous or foliaceous, or at least not scarious. Receptacle with chaff-like bracts, each subtending a flower. Anthers not caudate. Pappus paleaceous, of rigid awns, or cup-like, never of capillary bristles. Achenes thick or flattened contrary to the subtending chaffy bract, never parallel with it. (Rays none in Bebbia and one species in nos. 76, 79, 83, 84 and 87.)

72. MELAMPÒDIUM L.

Herbs with opposite ample leaves. Heads medium-sized, in leafy-bracted cymes or panicles. Involucre double, strongly dimorphous. Outer involucre of several loose often foliaceous plane bracts; inner involucre of smaller bracts, each completely enclosing a marginal achene and at length falling with it. Rays yellow or white, their achenes fertile. Pappus none. Disk-flowers yellow, perfect, their achenes sterile. (Greek melas, black, and pous, foot, a plant name captiously transferred by Linnaeus.)

1. **M. perfoliàtum** H.B.K. Coarse widely branched annual 3 to 4 ft. high; leaves 4 to 9 in. long, broadly rhomboidal-ovate, dentate, scabrous, acute, narrowed below into a winged petiole, the petioles connate around the stem in pairs; heads on slender peduncles; bracts of the outer involucre ovate to oblong, 5 to 6 lines long, united at base.—Waste places, Los Angeles; introduced from Mex.

73. ECLÌPTA L.

Low weak riparian herb with opposite leaves and white flowers. Heads solitary in the upper axils, the peduncles long or very short. Involucre broad, its bracts herbaceous and in about 2 series. Bracts of the receptacle awn-like. Rays short. Disk-flowers perfect and fertile, their corollas 4-toothed. Achenes thick, those of the ray 3-sided, those of the disk compressed. Pappus none or of a few short teeth. (Greek ekleipta, wanting, on account of the absence of the pappus.)

1. **E. álba** Hassk. Decumbent, 1 or 2 ft. high; leaves lanceolate or oblong-lanceolate, sparingly serrulate, sessile or the lower short-petioled with a strigose pubescence; disk-achenes at length corky-margined. — Shores of islands in the lower Sacramento River; Tex. to N. J. and Fla.; trop. Am. Sept.

74. GALINSÒGA R. & P.

Annual herbs with opposite leaves. Heads small, cymose or solitary. Involucre hemispheric, its bracts few, ovate, membranous and striate, in 2 series, often with some additional outer and very small ones. Receptacle conical or elongated, its bracts thin. Ray-flowers 4 or 5, fertile, the rays white, 2 or 3-lobed, often very small. Disk-flowers yellow. Pappus-paleae broad, with fimbriate or almost plumose margins, or none in the ray-flowers. (M. Galinsoga, a Spanish physician and botanist.)

1. **G. parviflòra** Cav. Stem with slender ascending branches, leafy almost throughout, ⅔ to 2 ft. high; herbage sparsely hispid, the inflorescence glandular-hispid; leaves ovate to lanceolate, acute, entire or serrate, thin, ¾ to 2 in. long; heads peduncled, 1½ to 2 lines high; rays very small, scarcely exserted; achenes black, turbinate, 4 or 5-angled; paleae of disk-pappus 8 to 16, nearly as long as the achene; pappus of ray-achenes very much reduced, unilateral.—Waste places and along irrigating ditches, Los Angeles; introduced from Mex.

75. BÉBBIA Greene

Strongly scented nearly leafless bushes. Stems intricately much branched, the ultimate branchlets ending in 1 (or a cluster of 2 or 3) discoid heads. Involucre about half length of disk, its few bracts imbricate in about 3 rows, striate. Bracts of the receptacle scarious, striate, ciliate-margined, partially enfolding the achenes. Flowers yellow. Achenes linear or turbinate, densely pubescent. Pappus a single series of 15 to 20 long-plumose bristles as long as the corolla and exceeding the achene. (M. S. Bebb, distinguished American salicologist.)

1. **B. júncea** (Benth.) Greene. Roundish bushes 1¼ to 4 ft. high, often twice as broad, the woody stems with gray fibrous bark, the rush-like branches green with remote leaves or almost none; leaves opposite below, alternate above, 1½ to 2 in. long, linear, or those of the vernal shoots lanceolate and 2 to 3 lines wide, often with 1 or 2 pairs of salient teeth at the middle; involucral bracts lanceolate, the outer canescent; outer bracts of receptacle oblong-ovate, the inner ovate or lanceolate; heads 4 to 5 lines high. —Rocky stream beds in the deserts: Inyo Co.; Mohave Desert; Colorado Desert, thence w. to Orange Co.; s. to L. Cal., e. to Ariz.

76. RUDBÉCKIA L.

Chiefly perennial erect herbs. Leaves alternate, simple or compound. Heads commonly showy, peduncled, terminating stems and branches. Rays in ours yellow and sterile, or none; disk purple or dark brown. Receptacle high conic or columnar. (Olaf Rudbeck, father and son, professors of botany at Upsala, two centuries since.)

Rays present.
- Pappus none; herbage rough-hairy ..... 1. *R. hirta.*
- Pappus present; herbage pubescent ..... 2. *R. californica.*

Rays none; pappus present; herbage glabrous or hirsutulose ..... 3. *R. occidentalis.*

1. **R. hírta** L. Black-eyed Susan. Stems branched above, 1 to several from a biennial root, channeled, 1 to 2¼ ft. high, the branches terminated by

956. Rudbeckia californica Gray; *a*, leaf x ⅛; *b*, fl. stem x ⅛; *c*, disk-fl. x 2.

single heads; herbage rough hirsute; leaves oblong to lanceolate, somewhat 3-nerved, entire, 1½ to 3 in. long, narrowed into margined petioles or the upper sessile; rays ¾ to 1⅛ in. long; disk globose or ovoid; bracts of the receptacle narrowly linear, acute, hirsute at tip; pappus none.—Introduced in the meadows of the Sierra Nevada from Mariposa Co. to Amador Co.; also occasional along irrigating ditches in Stanislaus Co.; native of e. U. S.

2. **R. californica** Gray. CALIFORNIA CONE-FLOWER. Fig. 956. Stem simple, 2 to 5½ ft. high, bearing a solitary long-peduncled head; herbage hispidulous or pubescent; leaves ovate to broadly lanceolate, 6 to 13½ in. long, the basal and lower long-petioled, the uppermost sessile, all entire or the lower ones irregularly incised or toothed, or sometimes 2-parted at base; rays 1 to 2 in. long, much exceeding the loose linear bracts of the involucre; disk short-oblong to columnar, 1 to 1½ in. long; bracts of the receptacle densely canescent at the very acute summit; achenes angled, flattish; pappus an irregularly 4-toothed cup. —Moist ground, montane, 5000 to 7000 ft.: Sierra Nevada from Kern Co. to Mariposa Co.; region of Mt. Shasta; north to sw. Ore.; uncommon.

3. **R. occidentàlis** Nutt. Stems simple, 3 to 4 ft. high, terminated by 1 or sometimes 3 columnar heads; herbage glabrous or hirsutulose; leaves ovate, acuminate, mostly rounded or subcordate at base, serrate, 3 to 6½ in. long, petioled or the upper sessile; disk oblong-conic, ¾ to 1¼ in. high; pappus a short but deeply denticulate or fimbriulate crown; rays none.—Middle altitudes, Sierra Nevada from Placer Co. to Butte Co.; n. to Wash. and Mont., e. to Nev.

77. VIGUÍERA H.B.K.

Herbs, shrubs or shrubby plants. Heads medium-sized. Bracts of the involucre in 2 or 3 series (in ours), shortly caudate-attenuate or linear-lanceolate. Bracts of the receptacle persistent and embracing the lightly compressed or 4-angled disk-achenes. Flowers yellow, the rays sterile. Corolla-tube of disk-flowers bulbous-dilated at the middle. Pappus-scales short, erose or laciniate, and with 2 longer paleaceous awns or lanceolate paleae, one at each angle of the achene, these latter deciduous, or the pappus none. (Dr. A. Viguier, French botanist.)

Leaves alternate or the lowest opposite, petioled; bracts of the involucre indurated and ribbed at base, the base commonly ovate, the apex herbaceous, narrowly and abruptly linear or lanceolate; pappus present; shrubs or shrubby plants.
  Leaves lanceolate; involucre green; achenes sparsely pubescent.....1. *V. laciniata.*
  Leaves ovate; involucre cinereous; achenes densely villous.
    Pappus dull or yellowish white; leaves green above, scabrous.....2. *V. deltoidea.*
    Pappus pearly white; leaves white-villous above, not all scabrous..3. *V. reticulata.*
Leaves chiefly opposite; bracts of the involucre herbaceous throughout; pappus none; herbs.
  Leaves conspicuously ciliate; annual.....4. *V. ciliata*
  Leaves not ciliate; perennial.....5. *V. multiflora.*

1. **V. láciniàta** Gray. Stems leafy to summit, branching to form a round-topped bush, 2 to 4 ft. high; herbage scabrous, resinous; leaves lanceolate from a broad often lobed base, varying from pinnatifid to nearly entire, acute,

prominently veiny below, shortly petioled, ¾ to 1½ in. long; involucre 4 lines high, its outer bracts ovate with abruptly acuminate spreading tips, the inner bracts narrow, erect; rays 5 to 7 lines long; achenes glabrate, very thinly hirsutulose, glabrate; longer pappus-paleae lanceolate, laciniate on the margins, shorter than the achene.—Sw. San Diego Co., common; s. to L. Cal.

2. **V. deltoídea** Gray var. **parishii** Rose. Stems several from the base, forming a compact shrub 1 to 2½ ft. high; leaves ovate, acute, broad or truncatish at base, subentire or serrate, ¾ to 1¼ in. long, short-petioled; heads on conspicuous nearly naked peduncles; involucre 3 to 4 lines high, its outer bracts cinereous with a close pubescence, lanceolate, attenuate, loose, the inner bracts linear, erect; rays 3 to 6 lines long; achenes hirsute-pubescent; pappus-awns lanceolate-subulate, almost as long as the achene, the membranous-margins at base more or less laciniate.—Mesas and rocky gullies: e. Mohave Desert; Colorado Desert, thence w. to San Diego Co.; e. to Ariz., s. to L. Cal. (V. parishii Greene.)

3. **V. réticulàta** Wats. Stems white-barked, several from the base, woody only at base, glabrate, few-leaved, forming a loose but erect bushy plant 2 to 4 ft. high; leaves coriaceous, cordate-ovate, entire, shortly acuminate, densely soft pubescent above, lightly pubescent, strongly veined and reticulate below, (1¼ or) 2½ to 4 in. long on petioles ¾ to 1⅛ in. long; heads small (3 to 4 lines high), in a corymbose panicle; involucral bracts 2 to 3 lines long, cinereous and somewhat thickened; rays 4 to 6 lines long; pappus-awns subulate from a paleaceous base, more or less lacerate on the sides, shorter than the achene.—Panamint and Funeral ranges.

4. **V. ciliàta** (Rob. & Greenm.) Blake. Stem slender, commonly branched from the base, 1 to 2 ft. high, sparsely pubescent or subglabrous; leaves linear, the margin mostly conspicuously ciliate; bracts of the involucre ciliate; flowers as in no. 1 (ex char.).—Santa Monica (introduced); s. Utah and N. Mex. to Sonora, Mex. (Gymnolomia hispida var. ciliata Rob. & Greenm.)

5. **V. multiflóra** (Nutt.) Blake var. **nevadénsis** Blake. Stems branching from the base, 1½ to 2 ft. high; herbage densely or lightly strigulose; leaves linear to linear-lanceolate, entire, revolute, ¾ to 2¼ in. long, mainly opposite; rays 10 to 15, 6 to 8 lines long; involucral bracts narrowly linear, canescent; heads 1 to 1¼ in. broad.—Inyo Co.: Argus Mts.; Panamint Mts.; n. to Ida., e. to N. Mex., s. to Mex.; adventive at Los Angeles and Santa Monica. (Gymnolomia nevadensis Nels.)

78. **HELIÁNTHUS** L. Sunflower

Stout coarse herbs with petioled simple leaves, yellow mostly entire rays and brownish or purplish disk. Leaves (all but the lower or lowest) alternate. Heads large, solitary on the ends of the branches or in terminal corymbs. Bracts of the involucre imbricated. Receptacle flat or convex, low-conic, its bracts persistent and embracing the 4-sided achenes. Pappus of pointed paleae borne at the angle of the achene, often with very small intervening scales, all deciduous. (Greek helios, sun, and anthos, flower, the heads turning toward the sun.)

Annuals; receptacle flat or nearly so.
- Involucral bracts ovate, abruptly attenuate ..... 1. *H. annuus.*
- Involucral bracts lanceolate, gradually attenuate.
  - Foliage green.
    - Bracts of the receptacle shorter than the disk-flowers, the central ones with hirsute brush-like tips; rays 9½ to 11½ lines long; mountain species ..... 2. *H. petiolaris.*
    - Bracts of the receptacle equaling or surpassing the disk-flowers, the tips not hirsute nor brush-like; rays 6 to 8 lines long; species of the valley and coast.
      - Stems scabrous; awn of the chaffy bract equaling the disk-flowers ..... 3. *H. bolanderi.*
      - Stems often hirsute, particularly near the heads; awn of the chaffy bract surpassing the disk-flowers ..... 4. *H. exilis.*
  - Foliage white with a strigose pubescence; desert species ..... 5. *H. niveus*

Perennials; receptacle convex to low-conical.
Outer bracts lanceolate to linear-subulate, equaling or exceeding disk.
Heads usually solitary; herbage hirsute; n. Sierra Nevada.....6. *H. cusickii.*
Heads usually corymbose or paniculate; herbage hispidulous to tomentose but not hirsute .....7. *H. californicus.*
Outer bracts shorter than the disk.....8. *H. gracilentus.*

1. **H. ánnuus** L. COMMON SUNFLOWER. Stem erect and simple or more or less branching, 2 to 5 ft. high; herbage rough-hispid; leaves deltoid-ovate, serrate, 3 to 8 in. long, the uppermost narrow and often entire, the petioles ½ to ¾ as long; bracts of the involucre ovate, slenderly acuminate; disk 1 to 1½ in. broad; rays 1 to 1½ in. long.—Moist lands in valleys, introduced from the Great Plains region: Great Valley to coastal S. Cal.

2. **H. pétiolàris** Nutt. Stem simple, slender, erect, 1½ to 2½ ft. high; herbage scabrous-hispidulose; leaves lanceolate, entire to obscurely dentate, rarely serrate, 1½ to 3 (or 4) in. long, on petioles about ½ as long; heads 2 to 3 in. wide, solitary or 2 or 3 long-peduncled; bracts of the involucre dark green, broadly lanceolate, with long tapering apex, ciliolate-margined; bracts of the receptacle unequally 3-cleft at apex, the middle tooth largest; rays yellow, ¾ to 1¼ in. long; disk-flowers brown; achenes oblong, 1½ lines long, villous. —San Bernardino Valley; San Bernardino Mts.; e. Placer Co.; Ariz. to Ore., Tex. and Sask.

957. Helianthus bolanderi Gray; *a*, fl. branchlet x ⅜; *b*, bract x 1; *c*, achene and pappus x 1.

3. **H. bolánderi** Gray. Fig. 957. Stems erect or diffusely branching, 1 to 3 ft. high, scabrous-hispid; leaves ovate- to oblong-lanceolate, serrate or entire; rays 8 lines long, toothed at apex; disk purple, 9 or 10 lines broad; bracts of the involucre hirsute, oblong-lanceolate, attenuate or acuminate; bracts of receptacle chaffy, 3-toothed, the middle tooth much longer and awn-like.—Low fields: Siskiyou Co.; Sacramento Valley; w. to the coast. Often abundant. Aug.-Nov. (H. scaberrimus Benth.)

4. **H. exílis** Gray. Stem slender, often unbranched, 1 to 2 ft. high; leaves ovate-lanceolate to linear-lanceolate; peduncles often hirsute-villous beneath the heads; bracts of the involucre lanceolate, hairy on the lower half; rays 6 to 7 lines long; awn-tip of the chaffy bract surpassing the disk-flowers.—Plains, valleys and foothills, 10 to 3500 ft.: Santa Clara Co.; Lake Co.; Sacramento Valley; Sierra Nevada foothills from Amador Co. to Mariposa Co.

5. **H. níveus** (Benth.) Bdg. Stem simple, erect, 7 to 12 in. high; herbage silvery-strigose; leaves ovate or lanceolate to narrowly oblong, 1 to 1½ in. long, more hairy on the upper side, 3-nerved beneath, on petioles ½ to 1½ in. long; heads terminal and in the upper axils, 1 to 2 in. wide; bracts of the involucre lanceolate, slightly longer than the disk-flowers, white-hairy; ray-flowers yellow, the rays 8 or 9-nerved, ¾ in. long, 3 to 4 lines wide; disk-flowers brown; pappus-paleae slender, caducous.—Colorado Desert, rare; s. to L. Cal. (H. tephrodes Gray.)

6. **H. cusíckii** Gray. Stems several or many from a thick root, forming clumps, 1 to 2¼ ft. high; herbage more or less hirsute; leaves narrowly lanceolate, entire, 2 to 5 in. long, attenuate at base into a short winged petiole; heads usually solitary; involucres 5 to 6 lines high, with linear-lanceolate hirsutulose bracts somewhat surpassing the disk; rays ¾ to 1½ in. long; achenes glabrous.—Lassen Co. to Shasta Co.; n. to Wash. June-July.

7. **H. califórnicus** DC. Fig. 958. Stems from somewhat tuber-like roots, 4 to 11 ft. high; leaves from oblong to narrowly lanceolate, some of the lower ovate, minutely hispidulous, 5 to 9 in. long including the petiole, the lower opposite, the upper alternate, the larger 3-ribbed; heads 2 to 3 in. broad, in a terminal corymbose panicle; chaffy bracts of the receptacle obtuse; bracts of the involucre lanceolate, tapering into long spreading tail-like tips;

rays about 15 to 20, 1 to 1¼ in. long; achenes flattish, glabrous; pappus of 2 or 3 lanceolate chaffy paleae.—Stream beds and banks, 10 to 1000 ft.: Sacramento Valley; Coast Ranges from Napa Co. to Santa Clara Co. Var. MARIPOSÀNUS Gray. Leaves ample, upper cauline ovate or oblong-lanceolate, entire or nearly so, exceeding the peduncles; pappus not rarely of 4 linear-lanceolate paleae of nearly equal length, or 2 often reduced and short.—Montane, 4000 to 6000 ft.: Sierra Nevada from Modoc Co. to Mariposa Co.; San Jacinto Mts. July-Aug. Var. PARÍSHII Jepson n. comb. Leaves lanceolate, acuminate, strigose to densely white-tomentulose beneath; upper leaf-like bracts commonly exceeding the short peduncles; involucre more or less canescent, the bracts shorter; pappus-paleae linear-subulate.—Los Angeles to San Bernardino Valley. (H. parishii Gray.)

958. Helianthus californicus DC.; *a*, leaf x ¼; *b*, fl. branchlet x ⅓; *c*, disk-fl. x 1½; *d*, achene and pappus x 2.

8. **H. graciléntus** Gray. Stem simple or branched above, erect, strict, 2 to 3 ft. high; herbage hispid; leaves opposite with fascicles of smaller ones in the axils, broadly lanceolate to linear-lanceolate, entire or obscurely denticulate, 3-nerved beneath, 2 to 4 in. long, the lower with petioles ½ to ¾ in. long, the upper sub-sessile, 1-nerved beneath; corymb with 2 to 5 heads, the heads on long (3 to 12 in.) peduncles; bracts of the involucre ovate to lanceolate, hispid; heads 1¾ to 2 in. wide, the involucre shorter than the disk; rays yellow, 7 to 10 lines long, disk-flowers yellow.—Cañons and hillsides, Santa Susana Mts. to San Bernardino and San Diego Co.

79. BÁLSAMORHÌZA Hook. BALSAM ROOT

Low perennials with thick or tuberous terebinthine-scented roots crowned by a tuft of basal leaves. Stems several, naked or few-leaved, bearing one or few large heads of yellow flowers. Both ray- and disk-flowers fertile. Receptacle flat or merely convex. Disk-achenes 4-sided or -angled and with intermediate nerves. Pappus none. (Greek balsamon, balsam, and rhiza, root.)

Rays none; disk-corollas with a strong longitudinal callous ridge opposite each sinus.—Sect. AGNORHIZA. ..... 1. *B. invenusta.*
Rays present; disk-corollas not longitudinally ridged.
Leaves entire or merely serrate, the principal ones with cordate base.—Sect. ARTORHIZA.
Stems with 2 or 3 small leaves, the large leaves basal.
Herbage scabrous with harsh often glandular hairs, or glabrate; involucre not woolly ..... 2. *B. deltoidea.*
Herbage silvery-tomentulose or canescent, the pubescence soft; involucre woolly ..... 3. *B. sagittata.*
Stems leafy; herbage green and glabrate ..... 4. *B. bolanderi.*
Leaves laciniately dentate to pinnately or bipinnately divided, not cordate.—Sect. EUBALSAMORHIZA.
Herbage canescent-pubescent, not at all hirsute; involucral bracts oblong-lanceolate to ovate ..... 5. *B. hookeri.*
Herbage green, roughish-hirsute or hispidulous, not tomentose; involucral bracts lanceolate or linear-acuminate ..... 6. *B. hirsuta.*

1. **B. invenústa** Cov. Stems branching, leafy, 2 to 3 ft. high; herbage scabrous; leaves long-ovate to ovate, subcordate or truncatish at base, acute or acuminate, 2 to 7¼ in. long; heads 10 to 11 lines high; bracts of the involucre linear or oblong, acute or acuminate, mostly shorter than the disk;

rays none; corolla-tube with 5 strong callous longitudinal ridges opposite the sinuses; achenes 4-angled, callous-ridged at the angles and with a weaker ridge between the angles, glabrous; summit of the achene thickened with 4 rounded knobs or tubercles at the angles and often with one small tubercle between the large ones.—Montane, 5500 to 6000 ft.: Sierra Nevada from Fresno Co. to Kern Co.

2. **B. deltoídea** Nutt. Stems 1 or several from a dense tuft of old leaf-bases on the root-crown, 1 to 2¼ ft. high; herbage green and scabrous or scabridulous, or the involucres and basal portions somewhat tomentose; basal leaves cordate-ovate, acute, entire or serrate, 6 to 12 in. long; bracts of the involucre linear-lanceolate or oblong, acute, more or less puberulent; rays ¾ to 1¼ in. long.—Middle altitudes in the mts., 3000 to 5500 ft.: San Rafael Mts. and e. to Kern Co., thence n. through the Sierra Nevada to Siskiyou Co., thence w. to Humboldt Co.; far n. to B. C. Apr.-June.

3. **B. sagittàta** Nutt. Stems usually several from a dense tuft of old leaf-bases, 1 to 2 ft. high; herbage silvery-tomentulose or canescent; basal leaves cordate-oblong or -ovate, entire or nearly so, 4 to 8 in. long, 2 to 4 (or 5½) in. wide at base, on petioles of greater length; cauline leaves few and inconspicuous, linear or lanceolate to spatulate; rays 1 to 1¾ in. long; outer 5 bracts of the involucre oblong-lanceolate, white-woolly, the inner linear-oblong, usually shorter, less woolly or glabrate.—Sandy and rocky points or opens, 5000 to 8000 ft.: west slope of the Sierra Nevada from Mariposa Co. to Tehama Co., east side from Inyo Co. to Modoc Co.; e. to the Rocky Mts. June-July.

4. **B. bolánderi** Gray. Stems leafy, ½ to 1½ ft. high; herbage green and glabrate; leaves ovate to suborbicular, subcordate or truncatish at base, entire or nearly so, 2 to 4¼ in. long, very reticulate-veiny when mature, the cauline similar to and as large as the basal ones; outer bracts of the involucre ovate, foliaceous, ¾ to 1 in. long; disk-achenes apparently flattened.—Interior foothills, 1000 to 2500 ft.: w. Tehama Co.; Sierra Nevada from Placer Co. to Mariposa Co. Apr.-May.

5. **B. hóokeri** Nutt. Stems scape-like, ½ to 1½ ft. high, from a thickened fusiform root, equaling or exceeding the leaves; herbage pubescent or canescent; leaves 7 to 10 in. long, pinnately divided (sometimes merely incised irregularly), the divisions serrate or again pinnately divided; bracts of the involucre oblong-lanceolate or ovate, acuminate, the outer with green tips; heads 1¾ to 2½ in. broad, including the ample rays.—Dry flats or hillslopes: Mt. Hamilton Range to the Oakland Hills; Sierra Nevada (3500 to 5000 ft.) from Mariposa Co. to Modoc Co., thence w. to Tehama and Siskiyou Cos.; n. to Wash., e. to Utah. Mar.-June. Var. INCÀNA Gray. Herbage loosely white-tomentose or shaggy.—Siskiyou Co.; n. to Wash., e. to Wyo. (B. incana Nutt.)

6. **B. hirsùta** Nutt. Stems 1 to 2 ft. high; herbage green, roughish-hirsute or hispidulous, not tomentose; leaves mostly basal, broadly lanceolate, pinnately parted or divided, the divisions incisely toothed or again pinnatifid; involucres hirsute-pubescent or glabrate, the outer bracts lanceolate or linear-acuminate, often with roundish-dilated base.—"Ne. Cal."; e. to Utah, n. to B. C. May.

80. **WỲETHIA** Nutt.

Perennial herbs with a basal tuft of ample leaves and several simple stems bearing mostly few and smaller leaves and one or few large heads. Root very stout, crowned by a short caudex. Leaves mostly entire. Involucre hemispherical or campanulate, its bracts in 2 or 3 series, the outermost often foliaceous and enlarged, the innermost small and bract-like. Receptacle flat or nearly so, its bracts rigid, linear or lanceolate, either flattish or partially folded around the achenes. Flowers yellow, both ray and disk fertile, the latter perfect; ligule of ray-corollas elongated and very conspicuous. Branches of the style in perfect flowers produced into subulate-filiform hispid appendages. Disk-achenes prismatic-quadrangular, sometimes flattened, those of the ray 3-angled. Pappus firm and persistent, consisting of a crown of unequal scales, or with rigid awns at the angles. (Capt. Nath. J. Wyeth, with whom Nuttall crossed the continent in 1834.)

Involucres campanulate, the bracts relatively few (about 10 to 16); achenes compressed quadrangular; rays few (5 to 8 or 14).
Herbage tomentose or woolly, often glabrate in age.
Rays hardly surpassing the involucre; pappus-crown short, 4 to 6-cleft; proper awns none; leaves roundish ovate, mostly rounded or truncatish at base; Sierra Nevada in Tulare Co.; San Jacinto Mts. and s.....1. *W. ovata.*
Rays conspicuous, 1 to 1½ in. long; pappus a crown of short scales with 2 to 5 subulate awns; leaves oblong-ovate, mostly acute at base; n. Sierra Nevada and North Coast Ranges.....2. *W. mollis.*
Herbage glabrous or only weakly puberulent; Humboldt Co.....3. *W. longicaulis.*
Involucres hemispherical, the bracts more numerous (about 20 to 40); rays many (10 to 27).
Heads relatively small (½ to 1 in. high); bracts of the involucre shorter than or little surpassing the disk; disk-achenes slightly compressed.
Pappus a crown of short denticulate scales, awns none; leaves mostly subcordate or truncatish at base.
Herbage glabrous, scabridulous; Eldorado Co.....4. *W. reticulata.*
Herbage tomentose or glabrate in age; Mariposa Co.....5. *W. elata.*
Pappus a chaffy crown with 1 to 4 subulate awns; herbage pubescent; widespread species.....6. *W. angustifolia.*
Heads very large and broad; outer bracts of the involucre large, ovate or oblong, much surpassing the disk and sometimes much exceeding the rays; achenes very stout and thick.
Herbage minutely or floccose-tomentose.....7. *W. helenioides.*
Herbage glabrous but minutely resinous.....8. *W. glabra.*

1. **W. ovàta** T. & G. Stems few or several from the root-crown, very short, 2 to 4 in. high, much exceeded by the leaves; herbage white-tomentulose when young, more or less glabrate; leaves round-ovate to elliptic-ovate, 3 to 6 in. long, on petioles 1½ to 4 in. long; heads on short (½ to 1½ in. long) peduncles, somewhat hidden by the leaves, 1 to 1¾ lines broad; bracts of the involucre linear or dilated above, 1 to 1½ times as long as the disk; bracts of the receptacle whitish-pubescent at tip; rays 5 to 8, 5 to 9 lines long; pappus bearing a lobed or fimbriate crown.—Open or openly wooded montane slopes, 3000 to 6000 ft.: mts. of s. Sierra Nevada in Tulare Co.; mts. of coastal S. Cal. (San Gabriel Mts., San Jacinto Mts., Palomar Mt., Cuyamaca Mts., Laguna Mts.); s. to L. Cal. May-June.

2. **W. móllis** Gray. Stems 1½ to 3 ft. high, bearing solitary or few heads; herbage white-woolly when young, in age greenish and merely pubescent; leaves oblong-ovate to obovate, acute or rarely obtuse at base, 7 or 10 to 19 in. long, long-petioled, the cauline few and usually small, rounded at base, short-petioled; heads campanulate, 6 to 7 lines high; bracts of the involucre lanceolate to ovate-lanceolate; rays 6 to 8 (or 14), 1 to 1½ in. long; achenes with acute angles, quadrangular or in the disk compressed, of a glaucous or dark slate hue, often glandular-dotted, their upper portion (and the pappus) minutely pubescent; pappus an irregular crown of scales with 2 to 5 subulate awns at the angles, the disk mostly with 2 awns or none.—Dry open ridges and pine flats, 5000 to 8500 ft.: Sierra Nevada from Mariposa Co. to Shasta and Modoc Cos.; n. Lake Co.

3. **W. longicáulis** Gray. Slender, 1 to 2 ft. high; herbage puberulent or the basal leaves glabrous; leaves all serrulate, the basal oblong-lanceolate, tapering to each end, about 10 in. long, short-petioled, the cauline smaller, short-petioled or the upper ones sessile; heads solitary or corymbose, on long slender peduncles; involucres campanulate, their outer bracts linear-oblong, mostly surpassing the inner and the disk; rays 6 to 9, ¾ to 1 in. long; achenes with a short erosely denticulate crown.—Ridges and opens of e. Humboldt Co.

4. **W. reticulàta** Greene. Stems rather slender, 14 to 19 in. high, leafy up to the inflorescence; leaves ovate, subcordate at base, acute, 3 to 6 in. long; the veins reticulate and shining beneath, all petioled; heads hemispherical, 6 to 7 lines high; bracts of involucre linear-oblong, obtusish, short, the outer 1 or 2 sometimes loose; rays 13 to 17, narrow, 1 in. long; pappus an extremely short erose-denticulate crown; no awn.—Sierra foothills in Eldorado Co. (Sweetwater Creek).

5. **W. elàta** Hall. Stems 1½ to 3 ft. high, leafy; herbage puberulent, the stems minutely glandular, the under side of the leaves tomentulose; leaves ovate, mostly subcordate or truncatish at base, shortly acuminate, 4 to 7 in.

959. Wyethia angustifolia Nutt.; *a*, leafy base x ⅙; *b*, fl. stem x ⅙; *c*, bract of receptacle x 1½; *d*, disk-fl. x ⅔; *e*, achene x 1½.

long, becoming coriaceous, the cauline all petioled; bracts of the involucre typically much shorter than the disk; rays narrow, 12 to 16, 1¼ to 1¾ in. long; pappus a crown of very short denticulate scales. — Mariposa Co., about 3500 ft.

6. **W. angustifòlia** Nutt. Fig. 959. Stems 1 to 2 ft. high, hirsute; herbage green; leaves elongated-lanceolate to narrowly or oblong-ovate, acuminate at both ends, entire or occasionally serrulate, the basal and lower ones ½ to 1¼ ft. long, the upper smaller, sessile or short-petioled; bracts of the involucre numerous, oblong-ovate to linear or lanceolate, hirsute- or villous-ciliate, commonly purplish-black at the often somewhat contracted base; bracts of the receptacle tipped with a short subulate hispidulose point; rays 10 to 17, 1¾ to 2 in. long; achenes minutely pubescent at summit, 3 lines long, bearing 1 or 2 (or those of the ray 3 or 4) stout minutely hirsute awns, with some very short intervening chaffy scales, all more or less united at base, rarely awnless.—Common on open plains and low hills, 200 to 2500 ft., sometimes montane up to 4000 or 5000 ft.: Coast Ranges from Siskiyou Co. to Monterey Co.; Sierra Nevada from Shasta Co. to Mariposa Co. The green shoots are eaten raw by the Hupas. Var. SOLANÉNSIS Jepson n. var. Leaves very narrow, 4 to 5 (or 6) lines wide.—Borders of low hills, 100 to 200 ft., Solano Co.: Montezuma Hills (Jepson, type); Araquipa Hills. Var. FOLIÒSA Hall. Herbage roughish pubescent; heads smaller than in the species; bracts more pubescent and less markedly ciliate.—Sierra Nevada from Fresno Co. to Mariposa Co., in the north passing by intergrades into the species.

7. **W. helènioìdes** Nutt. Stems 1 to 2 ft. high, soft-tomentose, almost glabrous in age; basal leaves 1 to 2 ft. long, 4 to 6 in. wide, acute at base and apex, often undulate, long-petioled; cauline leaves 3 or 4, much smaller, more commonly oblong-ovate, short-petioled; heads 2½ or often 3 in. broad; outer bracts of the involucre ovate-lanceolate or ovate, sometimes toothed; involucres mostly subtended by 1 or 2 conspicuous bract-like but short-petioled leaves; rays 12 to 18, 1 to 1¾ in. long; upper portion of achenes and pappus slightly pubescent, at least when young; pappus-paleae short, unequal. —Common in the foothills and bordering plains from Solano Co. to San Luis Obispo Co., the Great Valley and Sierra foothills.

8. **W. glàbra** Gray. MULE-EARS. Similar to no. 7; herbage green and glabrous throughout, minutely resinous-glandular or viscid, and scabrous, at least when dry; leaves as in no. 7 or broader and obtuse, sometimes toothed, rarely undulate; rays 12 to 27; achenes and pappus glabrous.—Open hills, Napa Co. to San Luis Obispo Co. Less common than no. 7.

81. HELIANTHÉLLA T. & G.

Low perennial herbs with the entire leaves chiefly in a basal tuft, the reduced cauline ones mostly opposite. Heads solitary, long-peduncled. Flowers yellow, the central cluster of the disk (in ours) sterile, the ray sterile. Involucre hemispherical, its bracts linear-lanceolate and loosely imbricated, the outer mostly foliaceous and attenuate-acuminate, the innermost shorter and chaff-like. Receptacle flat or convex, its bracts embracing the achenes. Achenes in ours compressed, with thin or margined edges and emarginate summit. Pappus a short awn or tooth from each margin with minute intermediate scales, or pappus none. (Diminutive of Helianthus.)

Involucral bracts not inflexed; rays 1½ to 3 lines broad; achenes 1½ to 2 lines broad; cauline leaves opposite ..... 1. *H. californica.*
Involucral bracts inflexed over disk after anthesis; rays 3 to 4½ lines broad; achenes 3 lines broad; cauline leaves alternate ..... 2. *H. castanea.*

1. **H. californica** Gray. Stems slender, 1 to 2 ft. high, occasionally branched; herbage glabrous, minutely scabrous; leaves oblong-lanceolate, 3 to 7 in. long, tapering into petioles, the cauline mostly opposite; heads mostly 1 to 1½ (or 2) in. broad; rays ½ to 1 in. long, usually little longer than the involucre; bracts of receptacle obtuse; achenes narrowly obovate, glabrous, narrowly margined, when young microscopically ciliate near the summit; pappus none or the achene when young with 1 or 2 very minute bristles and a few obscure teeth.—Higher ridges of the Coast Ranges, 2000 to 3000 ft., from Santa Clara Co. to Napa Co. May-June. Var. NEVADÉNSIS Jepson n. comb. Achene with 2 short persistent awns and usually several intermediate scales.—Sierra Nevada, 3000 to 5000 (or 7000) ft., from Mariposa Co. to Siskiyou Co., thence s. to Trinity Co. (H. nevadensis Greene.)

2. **H. castànea** Greene. Stems several from the root-crown, 10 to 13 in. high, simple or branched below, bearing large solitary heads; herbage hispidulose, especially the stems; leaves oblong-ovate to oblong-lanceolate, 3 to 6 in. long, petioled, the cauline alternate; heads 1¾ to 2 in. broad; rays 11 to 16; bracts of the involucre linear-acuminate, densely hispid-ciliate, otherwise sparingly pubescent or subglabrous; bracts of the receptacle densely hispidulous at the obtuse tips, subtended by 1 or few large leafy bracts; achenes broadly obovate, not margined, the outer ones distinctly thickened; pappus none.—Mt. Diablo region. Var. CÁNNONAE Jepson n. comb. Involucre subtended by several leaf-like petioled bracts; bracts pubescent.—San Francisco. (H. cannonae Eastw.)

82. **ENCELIÓPSIS** A. Nels.

Perennial herbs, the thick leaves in a sub-basal tuft and covered with a close dense silvery felt. Heads large, solitary on the naked scapes. Flowers yellow, the ray sterile. Receptacle flat. Bracts of the receptacle soft, scarious. Pappus a denticulate crown with 2 short subulate awns at the angles. Achenes flat, dark or black, bordered by a narrow callous border. (Encelia, and Greek opsis, likeness, in habit resembling the genus Encelia.)

1. **E. argophýlla** A. Nels. var. **grandiflòra** Jepson n. comb. Stem very short, branched and forming a crown with many clusters of basal leaves, the many scapes 1 to 2 ft. high; leaves rhomboid-obovate, obtuse or obscurely acute, 2 to 3 in. long, contracted to a margined petiole about ⅓ to ½ as long; bracts of the involucre lanceolate, abruptly attenuate; rays about 24 to 26, 1 to 2 in. long; achenes obovate, notched at apex, 5 lines long.—Cañons on the w. side of the Panamint Mts.; e. to southern Nev. (Encelia grandiflora Jones.)

83. **ENCÈLIA** Adans.

Ours low shrubs or suffrutescent plants. Leaves entire or remotely toothed, often 3-nerved from near the base. Heads mostly showy; rays yellow, often wanting; disk yellow or purple. Ray-flowers neutral. Involucral bracts in 2 or 3 series. Bracts of the receptacle scarious, striate, partially or quite enfolding the achenes. Achenes obovate, black, bordered by a rather obscure callous line; disk-achenes very flat, notched or truncate at summit, with conspicuously ciliate margins. Pappus in ours none, or rarely of 2 slender awns. (C. Encel, a writer on oak-galls acc. Asa Gray.)

Heads solitary on elongated peduncles: peduncles pubescent or scaberulous, naked above.
Disk purple; rays ¾ to 1¼ in. long; involucre densely hairy or white-villous; leaves green ..... 1. *E. californica.*
Disk yellow; involucre canescent.
Rays none; leaves green ..... 2. *E. frutescens.*
Rays ¼ to ½ in. long; leaves whitened ..... 3. *E. actoni.*
Heads in cymes, the peduncles smooth; rays ½ in. long; disk yellow; involucre sparsely pubescent; leaves silvery-tomentose ..... 4. *E. farinosa.*

1. **E. californica** Nutt. Stems slender, forming a spreading clump 2 to 3½ ft. high, woody only at base; leaves ovate to lanceolate, acute, mostly

entire, green, minutely scabrous or glabrate, 1½ to 2½ in. long, on short petioles; heads large, solitary, terminating elongated nearly naked peduncles; disk purple, ½ to ¾ in. broad; involucres densely white-villous, equaling the disk-corollas; rays 16 to 25, bright lemon-yellow, ¾ to 1¼ in. long; corolla-lobes of disk either glabrous or pubescent.—Dry hillsides and slopes of barrancas, Santa Barbara to San Diego and e. to Riverside. Mar.-May.

2. **E. frutéscens** Gray. Roundish bush 2 to 3 ft. high, broader than high with white stems and green leaves; leaves scabrous, the stems cinereous-scabrous; leaves ovate or oblong, ⅓ to 1 in. long, petioled from a mostly rounded base; heads 5 to 7 lines broad, on long peduncles naked above; involucres whitish-hispid, rather shorter than the disk; disk-corollas yellow, with glandular teeth; rays none; pappus wanting, or of 2 long-villous awns. —Dry hills in the deserts: Colorado and Mohave deserts; Panamint Mts.; e. to Ariz.

3. **E. áctoni** Elmer. Habit of and near E. frutescens, of which it may be only a radiate variety; leaves commonly broadly ovate, whitish-pubescent, ¾ to 1¼ in. long; heads larger, the disk ¾ to 1 in. broad; rays 8 to 18, 3 to 7 lines long.—Acton (Los Angeles Co.) to San Jacinto; ne. through the Mohave Desert to the Greenhorn Mts. and Inyo Co., thence e. to Utah.

4. **E. farinòsa** Gray. INCIENSO. One to 3 (or 5) ft. high, usually with distinct trunk, the numerous short branches very leafy at the ends and forming a low round-topped white bush from the summit of which arise the naked peduncles; peduncles cymosely-branched with several to many heads or simple and 1-headed; leaves ovate, silvery-tomentose or glabrate, 3-nerved, entire, ¾ to 2½ in. long, the petioles about ¼ as long; rays 8 to 18, broadly obovate or oblong, 4 to 6 lines long; involucres very short; lobes of disk-corollas glabrous.—Low hills or valleys or desert benches: San Gabriel Mts. to San Diego Co., mostly rare; Colorado and Mohave deserts; Inyo Co.; e. to Ariz., s. to Mex. Apr.-May.

84. **GERAÈA** T. & G.

Annual herbs with alternate dentate leaves. Heads usually few, paniculate, large. Flowers yellow; rays sterile. Involucre hemispheric, its linear or oblong bracts in 2 or 3 series. Receptacle flattish, its bracts soft, scarious, conduplicate. Style-branches long, villous. Achenes black with conspicuous white-callous margins, strongly flattened, narrowly cuneate; pappus-awns 2, naked, continuous from the sides of the achene, joined at base by a conspicuous crown. (Greek geraios, old, the achenes white-hairy.)

960. Geraea canescens T. & G.; *a*, fl. stem x ⅓; *b*, sect. of stem with leaves x ⅓; *c*, bract x 1⅓; *d*, achene x 1⅓.

Rays 4 to 10 lines long.....1. *G. canescens.*
Rays none.....2. *G. viscida.*

1. **G. canéscens** T. & G. DESERT SUNFLOWER. Fig. 960. Annual, usually branching from the base, 1 to 2 ft. high, hirsute with white hairs; leaves broadly ovate to lanceolate, acute, entire or few-toothed, 1½ to 4 in. long, sessile or narrowed to short margined petioles; heads 1 to several on long leafless branches or paniculate; bracts of the involucre linear-lanceolate, rather shorter than the disk, green but the margins copiously white-ciliate; rays 12 to 16, 4 to 10 lines long; achenes retuse between the awns which are as long as the disk-corollas. — Sandy soil in the deserts: Colorado and Mohave deserts; Inyo

Co.; e. to Nev. and Ariz. Also called Coyote Tobacco. Apr. (Encelia eriocephala Gray.)

2. **G. víscida** (Gray) Blake. Stems coarse, erect, 1¼ to 2¼ ft. high, coarsely viscid-pubescent and hirsute, the flowering branches mostly leafy and terminating in heads ¾ to 1¼ in. broad; leaves oblong-ovate, cordate-clasping at base, irregularly and often obscurely serrate, 1¼ to 4 in. long; rays none; bracts of the involucre oblong, acute, viscid-pubescent, shorter than the disk-corollas; achenes truncate between the awns which are half as long as disk-corollas. — Mts. of s. San Diego Co. (Campo, Potrero, Jacumba); n. L. Cal. June-July. Probably annual. (Encelia viscida Gray.)

85. **VERBESÌNA** L. Crownbeard

Erect branching herbs with simple dentate or entire leaves. Heads commonly on more or less elongated peduncles. Involucre hemispheric or campanulate, herbaceous, its ovate to linear bracts in 2 or 3 series. Receptacle usually conical, its bracts concave, folded about the outer edge of the achenes. Both disk- and ray-flowers yellow in our species. Achenes strongly flattened laterally, usually oblong or obovate, winged on each edge. Pappus of two awns, one to each edge of the achene. (Meaning of name unknown.)

Leaves sessile, green on both sides; achenes 5 to 6 lines long, thin-winged. . . . 1. *V. dissita.*
Leaves petioled, canescent at least beneath; achenes 2½ to 3½ lines long, corky-winged. . . . 2. *V. encelioides.*

1. **V. dissita** Gray. Stem 2 to 3 ft. high, probably from a woody perennial base; herbage green and glabrous; leaves mostly opposite, ovate, serrate to entire, obscurely scabrous, 2 to 4 in. long, commonly sessile by a broad or narrow base; heads short-peduncled, few in a terminal panicle; involucres 4 to 5 lines high, equaling or shorter than the disk, their bracts puberulent, linear and acute or the outer oblong-spatulate; achenes nearly glabrous, the body oblanceolate, the wings very broad above and narrow below, the whole fruit thus obovate; pappus-awns slender, coalescent with the wings at base.— San Bernardino Mts.; Orange Co.; s. to L. Cal.

2. **V. encèlioides** Gray var. **exauriculâta** Rob. & Greenm. Stem freely branching, 1 to 4 ft. high; herbage canescent; leaves ovate-lanceolate to broadly ovate, saliently dentate, strigose-whitened below, green above, 1¼ to 4 in. long, on petioles about ⅓ as long; involucral bracts lanceolate, 3 to 4 lines long; rays 12 to 15, orange-color, deeply 3-toothed, 5 to 6 lines long; achenes broadly winged on each edge when fully mature and thus obovate, obtuse, the wings becoming corky-thickened; awns of the pappus short.— Low plains and summer beds of winter flood streams, introduced into Cal. from the eastward: Salinas River; Glendale; Cahuenga Pass; Riverside; Ariz. to Tex., Col. and Mont.

86. **COREÓPSIS** L.

Perennials with thickened fleshy stems or annuals. Leaves dissected into linear or filiform lobes. Flowers yellow, in showy heads on long naked peduncles. Rays several or numerous, oblong or obovate, 3-toothed at apex. Involucre double; bracts of the inner series 8 to 12, erect, membranous; bracts of the outer series 5 to 8, narrow, loose and foliaceous. Receptacle nearly flat, its bracts thin, scarious, linear or lanceolate, falling with the fruit. Achenes flattened, more or less wing-margined. Pappus a minute ring or cup, or consisting of linear paleae. (Greek koris, a bug, and opsis, appearance.)

Perennials; stems stout, leafy; heads 2 to 3½ in. broad; pappus none.
  Peduncles scattered, 7 to 14 in. long; leaf divisions linear or broadly linear. . . . . 1. *C. maritima.*
  Peduncles corymbosely clustered, 3 to 6 in. long; leaf divisions narrowly linear to filiform . . . . . 2. *C. gigantea.*
Annuals; stems slender, usually decumbent at base; heads ¾ to 2 in. broad.
  Achenes alike in disk and ray, callus-margined, not ciliate; pappus none.
    Stems naked, the leaves all basal; ring of the disk-corollas usually bearded. . . . . 3. *C. douglasii.*
    Stems leafy; ring of the disk-corollas beardless. . . . . 4. *C. stillmanii.*
  Achenes unlike in disk and ray, those of the disk ciliate-villous; pappus of 2 linear paleae.

Stems leafy; ring of the disk-corollas pubescent. . . . . 5. *C. calliopsidea.*
Stems naked, the leaves all basal; ring of the disk-corollas beardless. . . . . 6. *C. bigelovii.*

1. **C. maritima** (Nutt.) Hook. Stem very stout, hollow, much branched above, 1 to 2⅔ ft. high; herbage somewhat fleshy, glabrous; leaves 3 to 5½ in. long, twice or thrice pinnately divided into linear or broadly linear lobes, the lobes ⅓ to 1¼ in. long, widely divergent; heads 2¼ to 3½ in. broad, on peduncles 7 to 14 in. long; outer bracts about 8, herbaceous, oblong, 6 to 10 lines long; inner bracts as long or shorter, broader than the outer, acute, yellowish; flowers yellow; ray-flowers mostly 17 to 20, the rays 3-toothed or deeply notched, ¾ to 1¼ in. long; ring of disk-corollas beardless; achenes oblong, glabrous.—Along the coast from s. Santa Barbara Co. to San Diego Co.; Santa Barbara Islands; s. to L. Cal. Mar. (Leptosyne maritima Gray.)

2. **C. gigantèa** (Kell.) Hall. Erect shrub 1 to 4 (or 6) ft. high, the main trunk very thick and fleshy, the primary branches distant, horizontal or ascending, leafy only towards the ends; herbage glabrous; leaves 3 to 12 (or more) in. long, twice or thrice pinnately divided into narrowly linear to filiform lobes, the lobes 5 lines to 2 in. long; petioles widened at base; heads many, cymosely clustered, 2 to 3 in. broad; outer bracts few, lanceolate, herbaceous, 3 to 6 lines long; inner bracts longer, ovate, acuminate, yellowish; ray-flowers yellow, the rays 8 to 12 lines long, 2½ to 4½ lines broad; disk-flowers yellow, 3 lines long, the corolla ring beardless; achene oblong, flattened, thinly and narrowly winged; pappus none.—Seacoasts: Santa Barbara Co. to Los Angeles Co.; Santa Rosa, Santa Cruz and Santa Catalina Islands. (Leptosyne gigantea Kell.)

3. **C. douglásii** (DC.) Hall. Stems 1 to several, scapose, erect, 5 to 14 in. high, the leaves in a basal tuft; herbage glabrous; scapes simple, one-headed; leaves narrowly linear to filiform, entire or pinnately parted into a few slender remote lobes, 1 to 3 in. long; heads (½ or) 1 to 1½ in. broad; outer bracts linear-lanceolate, 2½ to 3 lines long, herbaceous; inner bracts ovate, yellowish, thinner; rays 7 to 12, yellow, or frequently white on the upper third, 4½ to 6 lines long; disk-flowers yellow, the ring in the tube usually bearded; achenes thick, margined with a round corky wing, a thin corky ridge along the inner face; pappus none or reduced to a mere cup.—Valleys and mesas: San Luis Obispo Co. s. to coastal S. Cal.; Mohave and Colorado deserts; e. to Ariz., s. to Mex. and L. Cal. (Leptosyne douglasii DC.)

961. Coreopsis bigelovii Hall; *a*, habit x ¼; *b*, head x 1; *c*, inner bract x 2½; *d*, ray-achene x 2½; *e*, disk-achene x 2½.

4. **C. stillmánii** (Gray) Jepson. Stems 9 to 12 in. high, stoutish, leafy below, usually branched; leaves 1 to 2 in. long, pinnately divided into few remote linear lobes, the lobes entire or with one or few coarse salient teeth; leaf-divisions 1 line broad; involucre commonly somewhat hairy at base; disk-corollas beardless; achenes surrounded by a thick and corky rugose wing, smooth and glabrous on the back, the inner face sparsely papillose, or with a row of tubercles on the median ridge; pappus-cup either entire or 2-lobed.—Sacramento Valley; lower San Joaquin Valley. (Leptosyne stillmanii Gray.)

C. TINCTÒRIA Nutt. Annual; stem solitary, slender, erect, 2 to 3 ft. high; herbage glabrous; leaves few, pinnately divided into 3 to 7 (or the

lower 2) linear segments; heads several, corymbose; involucre hemispherical, the outer bracts ovate, ½ to 1 line long, the inner bracts broadly ovate, often reddish, 2 lines long; rays 4 to 6 lines long, yellow, the basal portion brown; achenes wingless, the pappus an obscure border or none.—Garden plant, introduced from cent. U. S.: an escape at Redding and Kaweah.

5. **C. calliopsídea** (DC.) Bol. Stem leafy, ½ to 1 (or 2) ft. high; leaves 1 to 2 in. long, the lower ½ or ⅔ petiole-like but broad or ligulate, the upper portion pinnately parted, the lobes entire or deeply few-toothed; outer bracts of the involucre broadly ovate, conspicuously shorter than the narrowly ovate inner ones; rays ½ to 1 in. long, 3 to 7 lines wide, 15 to 20-nerved; ring of the disk-corollas pubescent; achenes of the ray- and outer disk-flowers oval, flat and glabrous; disk-achenes cuneate-oblong, long-villous on the margins and inner face; pappus-paleae 2, linear.—Moist hillsides: South Coast Ranges; Mohave Desert. (Leptosyne calliopsidea Gray.)

6. **C. bigelòvii** (Gray) Hall. Fig. 961. Stems 1 to several, commonly simple, scape-like and erect from a basal tuft of leaves, 8 to 14 in. high; leaves pinnately parted into linear lobes, sometimes linear and entire, 2 to 4 in. long; bracts of the outer involucre narrowly linear, loose or spreading; inner involucre 3¾ to 5 lines high, its bracts quadratish or broadly ovate, erect; flowers yellow; rays 4½ to 9 lines long; ring of disk-corollas beardless; achenes oblong, very flat; ray-achenes glabrous, with a narrow winged margin, pappus none; disk-achenes with a conspicuous marginal fringe of villous hairs; pappus-paleae 2, linear-lanceolate, finely ciliate, ½ as long as the achene.—Desert flats, 2000 to 4000 ft.: Colorado and Mohave deserts; n. to Kern and Inyo Cos. Apr.-May. (Leptosyne bigelovii Gray.)

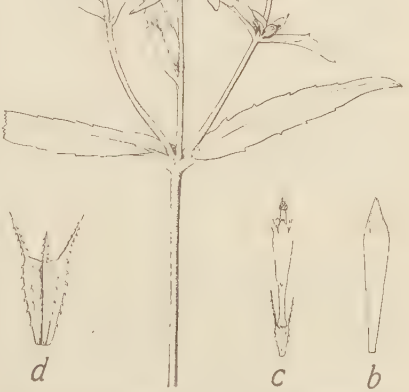
87. **BÌDENS** L. Bur Marigold

Herbs with opposite leaves and yellow flowers. Heads many-flowered; rays 3 to 9, sterile. Involucre double, the outer bracts linear-oblong, foliaceous, the inner elliptic to ovate, membranous. Achenes somewhat flattened parallel with the scales of the involucre or slender and 4-sided, those of the disk crowned with 2, 3, or 4 rigid persistent barbed awns. (Latin bidens, 2-toothed.)

Leaves simple; rays 3 to 9, conspicuous; achenes downwardly barbed on the margin.
- Outer involucre little or not at all surpassing the disk; rays very showy, golden yellow..... 1. *B. laevis.*
- Outer involucre foliaceous and surpassing the disk; rays usually light yellow, smaller..... 2. *B. cernua.*

Leaves pinnately 3 to 5-divided; rays inconspicuous or lacking; achenes upwardly barbed on the margin.
- Outer involucral bracts much exceeding the inner, usually longer than the disk; rays 1 to 5, inconspicuous..... 3. *B. frondosa.*
- Outer involucral bracts barely equaling the inner, shorter than the disk; rays none..... 4. *B. pilosa.*

1. **B. laèvis** B. S. P. Bur Marigold. Fig. 962. Annual (or in the south perennial); stem often decumbent at base, 1 to 3 or even 5 ft. high, glabrous; leaves lanceolate, usually tapering to the subsessile base, evenly serrate, more or less connate at base, 3 to 8 in. long; outer involucre rather longer than the inner, the bracts often serrulate; rays oval,



962. Bidens laevis B. S. P.; *a*, fl. branchlet x ½; *b*, bract x 2; *c*, disk-fl. x 2; *d*, achene x 2.

963. Bidens frondosa L.; *a*, fl. branchlet x ½; *b*, disk-fl. x 3; *c*, ray-fl. x 3; *d*, achene x 2.

golden brown, ¾ to 1 in. long; disk brownish; heads in fruit erect or nodding; achenes flat or flattish, cuneate, distinctly carinate on the sides and retrorsely hispid on the marginal angles; awns 2 or 3.—Low wet ground, marshes or river lowlands, 10 to 1200 ft.: coastal S. Cal.; South Coast Ranges; San Joaquin and Sacramento valleys; e. to Mass. and Fla., s. to Mex. Sept.-Oct. (B. chrysanthemoides Michx. B. expansa Greene.)

2. **B. cérnua** L. Nodding Bur Marigold. Annual; stems 8 to 20 in. high, glabrous or setulose-hispid; leaves oblong-lanceolate, rather irregularly serrate, mostly not connate; outer involucral bracts exceeding the disk, spreading, foliaceous; rays 6 to 10, mostly light yellow, 3 to 6 lines long, sometimes none; heads strongly nodding in fruit; achenes 4-angled and usually 4-awned.—Wet soil, infrequent: San Francisco; Mt. Shasta; Yreka; n. to Can., e. to N. Car.

3. **B. frondòsa** L. Beggar-ticks. Fig. 963. Annual; stem erect, 3 or 4 ft. high, glabrous or slightly pubescent; leaves 3 to 5-divided, the divisions or leaflets petiolulate, lanceolate, coarsely toothed; rays 1 to 5, inconspicuous, usually shorter than the greenish yellow disk; achenes very flat, cuneate-oblong, 4 to 5 lines long, dentate on the margin with barbs upwardly pointed (except at the summit), 2-awned; heads erect in fruit, usually surpassed by the outer foliaceous bracts.—Wet lowlands: San Joaquin Valley; Sacramento Valley; n. to B. C., e. to N. S. and Fla. Sept.

4. **B. pilòsa** L. Annual; stem ⅔ to 4 ft. high, usually branched from the base; herbage pilose-pubescent to nearly glabrous; leaves pinnate; leaflets 3 to 5, ovate, serrate, ⅛ to 1 in. long; heads about 4½ lines broad, scattered, the peduncles commonly ¾ to 2¼ in. long; rays usually none, small and yellowish white when present; achenes linear, tetragonal, about 4½ lines long, marked with scattered ascending barbs; awns 2 to 4.—Native of the tropics, naturalized along irrigating ditches and water courses: coastal S. Cal.; n. to San Luis Obispo Co.

Tribe **Calendùleae.** Marigold Tribe. Bracts of the involucre in 1 or 2 rows. Receptacle naked. Ray-flowers perfect, disk-flowers staminate. Achenes of ray-flowers large, crescent-shaped or coiled into a ring, roughly warty ridged on the back. Pappus none. Calénḍula officinàlis L. Pot Marigold. Annual; leaves oblong, entire, sessile; heads showy; flowers yellow.—Garden plant from Eur., adv. at Sonoma.

Tribe 7. **Madieae.** Tarweed Tribe

Ours commonly annuals. Herbage commonly glandular, viscid or heavy-scented. Leaves alternate or opposite. Bracts of the involucre in a single series, each partly or completely enclosing an achene. Bracts of the receptacle commonly in a single series between disk- and ray-flowers and often united into a cup, or sometimes scattered among the disk-flowers. Rays always present, showy or inconspicuous. Anthers not caudate. Ray-achenes always fertile, without pappus (except nos. 93 and 98 and sometimes in no. 94); disk-achenes fertile or sterile, their pappus paleaceous, awn-like or none.

88. **BLÉPHARIPÁPPUS** Hook.

Annuals with alternate narrowly linear entire leaves. Stem paniculately branched, the heads terminating the branchlets. Bracts of involucre linear-oblanceolate, nearly equal, in 1 or 2 series. Receptacle convex, all the flowers subtended by bracts, the bracts distinct, narrow, thin or scarious. Flowers white, both ray and disk. Ray-flowers 3 to 6; disk-flowers 7 to 12. Fertile disk-flowers with filiform 2-cleft style; sterile disk-flowers with entire style. Achenes turbinate, silky-villous. Pappus present in both disk and ray, consisting of many paleae, the paleae linear or oblong, scarious or hyaline, inconspicuous, lacerate or fimbriate; or pappus sometimes none. (Greek blepharis, eyelash, and pappos, pappus, in allusion to the fringed paleae.)

1. **B. scàber** Hook. Stem erect, simple below, paniculately branched above, leafy, 5 to 9 in. high; leaves 2 to 8 lines long; heads 2 to 3 lines high.—Dry hills, 1800 to 2500 ft.: Siskiyou Co.; n. to southern Ore. and to Ida.

89. **CENTROMÀDIA** Greene. SPIKEWEED

Rigidly branching annuals with alternate spinescent leaves, the lower pinnatifid, the upper entire. Herbage more or less glandular and scented. Heads racemose along the branches and terminal, sometimes subsessile in the forks. Involucral bracts spinescent. Receptacle with chaffy bracts throughout, none of the outer united or connate. Flowers yellow, with 25 to 40 small bifid rays. Disk-achenes chiefly sterile, with or without narrowly linear or bristle-like paleae. Ray-achenes more or less triangular, smooth or roughish on the back, the inner terminated by an erect beak-like apiculation. (Greek kentron, a prickle, and Madia, an allied genus.)

Herbage yellowish green, sparsely hirsute, sweet- or honey-scented; floral leaves little or not all surpassing the heads ..... 1. *C. pungens.*
Herbage dark, rather densely villous-hirsute, ill-scented; floral leaves often conspicuously surpassing the heads ..... 2. *C. fitchii.*

1. **C. púngens** (T. & G.) Greene. COMMON SPIKEWEED. Fig. 964. Stem rigidly and freely branching, commonly from near the base, sometimes only above, ¾ to 2 or 3 ft. high; herbage sparsely hirsute or hispid with spreading hairs, seldom viscid or glandular; leaves (especially of the flowering branches) linear-subulate, spinose, entire, the lower and lowest pinnately parted into oblong lobes, or pinnatifid, the lobes or teeth spinosely or pungently tipped; bracts of the receptacle cuspidate; pappus of disk none; ray-achenes roughish, somewhat laterally 2-nerved on back, the inner edge terminated by a short beak-like apiculation.—Plains and valley floors, especially in alkaline or subsaline areas, 10 to 500 ft.: San Joaquin Valley; South Coast Ranges; coastal S. Cal. On the alkaline plains of the upper San Joaquin Valley this species covers tens of thousands of acres and often forms thickets 4 or 5 ft. high. It is a valued bee plant. (Hemizonia pungens T. & G. C. maritima Greene.) Var. PÁRRYI Hall. Herbage minutely glandular; bracts of receptacle thin, obtuse or acute and tapering to a weak spine; disk-achenes with 3 to 5 slender almost bristle-like paleae as long as the corolla; ray-achenes semi-obcordate in outline.—Sacramento and Napa valleys to coastal S. Cal. May-Oct. (Hemizonia parryi Greene.) Var. CONGDÒNII Jepson n. comb. Herbage not glandular; involucral

964. Centromadia pungens Greene; *a*, fl. branchlet x ½; *b*, head x 1½; *c*, bract x 3; *d*, disk-fl. x 3; *e*, achene x 4½.

bracts much exceeding the flowers; bracts of receptacle thin, not rigid nor spinose; disk-flowers with pappus of 3 linear-subulate awns exceeding the corolla.—Monterey and San Luis Obispo Cos. May-Sept. (Hemizonia congdonii Rob. & Greenm. H. pungens var. congdonii Jepson.)

2. **C. fitchii** (Gray) Greene. Fitch's Spikeweed. Stem diffusely branched above or at the base, 9 to 16 in. high; herbage hirsute or villous with spreading hairs; leaves of the basal tuft pinnately parted into remote narrowly linear pungent lobes; cauline leaves linear and entire, tapering into a subulate or pungent tip, those about the head spreading and star-like, mostly all bearing stipitate glands; bracts of the involucre subulate, usually far exceeding the flowers, those of the receptacle pointless, soft, hairy; ray-achenes flattened laterally, nearly semi-circular in outline, smooth or tuberculate, with a short thick beak; pappus of disk-achenes of 8 to 12 linear paleae as long as the corolla and hairy and fimbriate at the tip.—High sandy land in the valleys and foothills, 100 to 2700 ft.: Sierra Nevada foothills from Mariposa Co. to Butte Co.; lower San Joaquin Valley; Sacramento Valley; North Coast Ranges from Napa and Sonoma Cos. to Mendocino and Siskiyou Cos.; n. to southern Ore. May-Sept. (Hemizonia fitchii Gray.)

90. **HOLOCÁRPHA** Greene

Corymbosely branching annual with very viscid-glandular herbage. Leaves of the axillary fascicles and those about the heads narrowly linear, beset with stipitate glands and tipped with a truncate gland. Heads solitary or commonly glomerate at the ends of the branches. Bracts of the convex receptacle each subtending a flower, the outer and those of the involucre abundantly covered with slender or clavate colorless gland-tipped processes. Ray-flowers many, with short yellow ligules; achenes 4-ridged on back, the ventral angle ending in a beak. Disk-flowers with sterile achenes. Pappus none. (Greek holos, whole, and karphos, chaff, the whole receptacle chaffy.)

1. **H. macradènia** (DC.) Greene. Stem corymbosely branching from above the base, ¾ to 1 ft. high; herbage thinly hirsute, unpleasantly odorous; leaves linear, serrate or entire, ¾ to 1½ in. long, those of the branchlets and fascicles linear, 1 to 8 lines long; heads ½ in. broad; rays 9 to 13.—Low dry fields about San Francisco Bay: San Lorenzo; Berkeley; Ross Valley. Aug.-Sept.

91. **HEMIZÒNIA** DC. Tarweed

Annuals (or two species perennial) with viscid-glandular heavy-scented herbage. Leaves narrow, alternate (or the lowest sometimes opposite). Flowers yellow or white, in mostly numerous heads. Disk-flowers surrounded by a circle of chaffy and often slightly united bracts or the disk chaffy throughout. Ray-achenes fertile, without pappus, thick, short, turgid, half enclosed by the lower part of the bract of the involucre which falls with it or is at least deciduous; areola of the ray-achenes borne on the inner angle at apex, or most commonly raised on an intra-apical and very distinct beak. Disk-achenes sterile or fertile, with or without pappus. (Greek hemi, half, and zonia, zone, the bracts but half enclosing the fruit.)

A. Receptacle with chaffy bracts throughout.

Ray-achenes not beaked, obovate-triangular; ray-flowers white or light yellow.
- Heads paniculate or corymbose ..... 1. *H. congesta.*
- Heads racemosely disposed along simple branches ..... 2. *H. clevelandii.*

Ray-achenes beaked, somewhat 5-nerved or angled; rays 4 or 5 (to 8), yellow; leaves crowded on the branchlets ..... 3. *H. virgata.*

B. Receptacle with a cup-like circle of bracts between disk and ray; flowers yellow.

Pappus of disk-achenes present (rarely none in H. corymbosa); ray-achenes beaked.
- Rays mostly 5 (3 to 8); disk-flowers not over 10; annuals.
  - Disk-flowers 6 or 7.
    - Heads shortly peduncled ..... 4. *H. wrightii.*
    - Heads mostly sessile in small clusters ..... 5. *H. fasciculata.*
  - Disk-flowers 3 ..... 6. *H. lobbii.*
- Rays 8 to 20; disk-flowers as many or more.
  - Annuals; at least the involucres glandular.
    - Disk-achenes well formed and with pappus of oblong obtuse pubescent or erose paleae.

Beak of ray-achenes curved; some of the cauline leaves pinnatifid..... 7. *H. paniculata.*
Beak of ray-achenes straight; cauline leaves all entire..8. *H. floribunda.*
Disk-achenes wholly sterile and with pappus of minute fimbriate scales or wanting .....9. *H. corymbosa.*
Perennials.
Lower part of stem with woolly flocs in the old leaf axils; leaves thin, not glandular, 1 to 3 in. long; flowering branchlets rather sparsely leafy, the involucres almost concealed by the leafy bracts; involucre about equaling the flowers; ray-achenes with flat face; insular.... 10. *H. clementina.*
Lower leaf axils not woolly; leaves thickish, those of the branchlets sometimes subterete, glandular-stipitate, ½ to 3 lines long; flowering branchlets densely leafy, somewhat heath-like; involucres scarcely leafy-bracteate or only sparsely and shortly so; flowers half larger than the involucre; ray-achenes with a longitudinal median angle on the face; mainland .....11. *H. minthornii.*
Pappus none; ray-achenes not beaked; rays 5 or 6, bright yellow; marginal bracts of receptacle distinct; leaves entire, annual.....12. *H. wheeleri.*

1. **H. congésta** DC. Stem erect, corymbosely branching above the base, 12 to 16 in. high; herbage soft-hirsute or villous, a little glandular; leaves narrowly linear or oblanceolate, remotely and minutely toothed or entire, 1 to 4 in. long; heads in small clusters on the ends of the branchlets, somewhat leafy-bracteate; bracts of the involucre densely long-villous, commonly little surpassed by the white rays; outer bracts of the receptacle either lightly connate or nearly distinct; achenes with conspicuous inflexed stipe.—Coast ranges from Humboldt Co. to San Luis Obispo Co. July. Var. LÙZULAEFÒLIA Jepson n. comb. Hayfield Tarweed. Fig. 965. Stem diffusely branched or erect, 1 to 2 ft. high; lower leaves crowded and more or less tufted, narrowly linear, mostly tapering somewhat to the apex, 3 to 5 in. long, 3 to 5-nerved, canescent with appressed soft silky hairs which are more or less floccose-deciduous; upper leaves much reduced; tips of the involucral bracts acute or obtuse, short; outer bracts of the receptacle united into a cup; rays 6 to 10, white or pink-tinged; achenes with very short stipe.—Dry valleys and low hills, 20 to 1500 ft.: Great Valley; Coast Ranges from Napa Co. to San Luis Obispo. July-Oct. (H. luzulaefolia DC.) Var. LUTÉSCENS Jepson n. comb. Similar to var. luzulaefolia except that the flowers are yellow.—Fields near the coast from Monterey Co. to Marin and Napa Cos. May-Nov. (H. luzulaefolia var. lutescens Greene.) Var. TRÀCYI Jepson n. comb. Herbage non-glandular, glabrous below, viscid-pubescent to puberulent above; lower leaves few.—Humboldt Co. July-Sept. (H. congesta subsp. tracyi Babc. & Hall.) Var. CALYCULÀTA Jepson n. comb. Branches of inflorescence widely spreading or divaricate; leafy bracts much longer than heads; inflorescence widely branched; plants commonly 4 to 9 in. high.—Nw. Lake Co.; Mendocino Co. (H. congesta subsp. calyculata Babc. & Hall.)

965. Hemizonia congesta var. luzulaefolia Jepson; *a*, fl. branchlet x 1; *b*, ray-fl. x 3; *c*, achene x 4½.

2. **H. clevelándii** Greene. Stem erect, usually simple below, branched mostly at the middle or above, 1 to 2 ft. high; herbage commonly much less glandular than in no. 1; bracts of the involucre rather markedly ciliate with white hairs, especially at base; heads disposed to be racemose on the branches as well as terminal.—Dry flats or hills, 1000 to 4000 ft.: Sonoma Co. to

966. Hemizonia virgata Gray; *a*, habit x ½; *b*, head x 4½; *c*, disk-fl. x 3; *d*, leaf of upper branchlet x 1½.

Humboldt Co. and e. to Lake, w. Colusa and w. Glenn Cos.; n. to southern Ore. July-Sept.

3. **H. virgàta** Gray. Fig. 966. Stem erect, 1 to 1½ ft. high, commonly branching at the middle into several virgate branches bearing numerous racemosely disposed heads on short lateral branchlets; herbage viscid-glandular or minutely stipitate-glandular, glabrous or nearly so; leaves linear, serrate to somewhat saliently toothed, sometimes entire, 1 to 2¼ in. long; leaves of the branches linear, ½ to 5 lines long, crowded on the branchlets and fascicled in the axils, those of the branchlets truncate and tipped with a disk-like or saucer-shaped gland; involucres oblong, the bracts 5, stipitate-glandular on the back, the involute tip ending in a truncate gland; ray-flowers 4 or 5; disk-flowers 7 to 10; ray-achenes shining black, beaked with a thick beak; pappus of disk-flowers none.—Dry valley floors and low hills, 10 to 2500 ft.: Sierra Nevada foothills; Great Valley; Lake Co.; South Coast Ranges; coastal S. Cal. July-Oct. Var. HEERMÁNNII Jepson n. comb. Herbage viscid, pubescent or somewhat hirsute, heavy-scented; leaves of the flowering branchlets minute, less crowded; involucres hemispherical, their bracts beset with stalked glands; ray-flowers 5 to 8; disk-flowers 10 to 15; ray-achenes with a somewhat conspicuous beak and stipe.—Sierra Nevada; Mt. Diablo Range; Sierra Nevada foothills from Calaveras Co. to Kern Co.; s. to Ventura Co. May-July. (H. heermannii Greene.)

4. **H. wrightii** Gray. Stem erect, paniculately branching, 1 to 3 ft. high, the heads on very slender or filiform peduncles; herbage mostly hispid, especially below, somewhat glandular above; leaves broadly linear, pinnately parted or coarsely toothed to entire, 1 to 2 in. long, those of the filiform flowering branchlets linear or linear-lanceolate, often dilated at base, 1 to 7 lines long; heads narrow; ray-flowers 5, the rays 2 to 2½ lines long; ray-achenes slightly curved, roughened on the beak and sides, beaked, short-stipitate; disk-flowers about 6 or 7; pappus of about 8 to 10 linear paleae irregularly lacerate at summit.—Valley flats and foothills, 500 to 5000 ft.: coastal S. Cal.; w. Mohave Desert; Great Valley; inner South Coast Ranges; s. Sierra Nevada foothills. June-Aug. Var. KELLÓGGII Jepson n. comb. Paleae united almost to the summit, sometimes only at base.—Sacramento and San Joaquin valleys. (H. kelloggii Greene.)

5. **H. fásciculàta** T. & G. Fig. 967. Stem erect, paniculately branched above the base, ¾ to 2 ft. high; herbage sparsely hirsute and hispid, or disposed to be nearly glabrous; leaves of the main stem oblong, pinnately cleft, few-toothed or entire, ¾ to 1½ in. long; leaves of the branches and branchlets linear or sub-lanceolate, entire, 1 to 7 lines long, some a little dilated at base; heads small, usually fascicled in dense small clusters, the clusters 5 to 10 lines broad; bracts of the involucre glabrous or glandular-hispidulous, those of the receptacle slightly united; ray-flowers 5; ray-achenes smoothish or transversely rugose, with a very short beak; disk-flowers 6; disk-achenes with a pappus of 6 to 10 linear paleae minutely lacerate at tip.—Dry valley floors or low hills, 50 to 1500 ft.: South Coast Ranges, coastal S. Cal. June-July.

6. **H. lóbbii** Greene. Similar to no. 5; stem erect, more or less diffusely branched, ½ to 3 ft. high, the branches long and slender, the branchlets with very small and numerous leaves; herbage, at least the inflorescence, usually resinous-glandular; clusters of fewer heads or the ultimate branches often 1-headed; ray-flowers 3 (or 4); disk-flowers 3 (or 4), each subtended and partly enclosed by a distinct bract.—Hillsides and valley flats, 250 to 1000 ft.: Santa Clara Co. to Monterey and San Luis Obispo Cos. July.

7. **H. pániculàta** Gray. Stem erect, commonly simple below, diffusely branched above, 1 to 3 ft. high; herbage more or less thinly hirsute, especially below, glandular-viscid above; leaves oblong, laciniate-pinnatifid, ¾ to 1¼ in. long, those of the branchlets linear, entire, erect, more or less crowded, 2 to 7 lines long; ray-flowers about 8, their achenes rugose or pitted dorsally, shortly beaked; disk-achenes 12 to 19, often well formed and apparently fertile, pubescent, their pappus-paleae 8 to 10, oblong, laciniate or erose at summit.—Dry hills or valleys, 50 to 1500 ft.: San Luis Obispo Co. to San Diego Co. May-July.

967. Hemizonia fasciculata T. & G.; *a*, fl. branchlet x ½; *b*, disk-cup and disk-fls. x 1½; *c*, disk-fl. x 3; *d*, ray-fl. x 3.

8. **H. floribúnda** Gray. Stem stout, erect, very leafy, 1½ to 2½ ft. high, ending above in an elongated raceme of heads; herbage villous, minutely glandular; leaves linear, entire, ¾ to 1 in. long, those of the branchlets and fascicles 2 to 4 lines long; ray-flowers 15 to 20, the rays 2½ lines long; ray-achenes rugose-tuberculate, beaked; pappus-paleae of disk-flowers 5 to 8, hairy.—Dry hills, s. San Diego Co.

9. **H. corymbòsa** (DC.) T. & G. Coast Tarweed. Stem corymbosely and widely branching, 1 to 1½ ft. high; herbage hirsute-pubescent and glandular, sweet-scented; leaves oblong to linear, ¾ to 3½ in. long, pinnately divided into linear lobes, the lobes in lower leaves entire or sometimes toothed, those in upper leaves sometimes only 1 or 2 pairs; uppermost leaves or those of the flowering branchlets linear, entire, 2 to 6 lines long; heads 7 to 10 lines broad; rays 13 to 20, oblong-cuneate, bright yellow, 2 to 4 lines long, 3 or 4-toothed; ray-achenes beaked; pappus of the disk-achenes of minute fimbriate-bristly or entire scales, or none.—Valley flats and hillsides, 50 to 1500 ft.: Humboldt Co. to San Luis Obispo Co., thence e. to western Kern Co. May-Aug. Var. angustifólia Jepson n. comb. Diffusely branched; stem leaves mostly linear and entire.—Along the coast from Monterey Co. to San Mateo Co. Aug.-Sept. (H. angustifolia DC.) Var. bárclayi Jepson n. comb. Disk-flowers with more conspicuous laciniate pappus.—Monterey Co.; Kern Co. May-Sept. (H. angustifolia var. barclayi Gray.)

10. **H. clementìna** Bdg. Stems several from the base, woody below, 1 to 2 ft. high, freely branched above, the branchlets ending in 1 to few heads; herbage hirsute, a little viscid above; leaves linear, entire or with a few remote and short but somewhat salient teeth, 1 to 3 in. long, those of the branchlets or axillary fascicles 3 to 6 lines long; heads markedly leafy-bracteate; rays about 12 to 20, yellow, 2 lines long; ray-achenes rugose-tuberculate, stipitate, beaked; pappus-paleae of disk-achenes 9 or 10, linear-subulate, unequal, about equaling or little exceeding proper tube of corolla.—Santa Catalina Isl.; San Clemente Isl.

11. **H. minthórnii** Jepson n. sp. Stems several from the short woody crown of a very stout root, slender, erect or diffuse, racemosely or corymbosely branched, ½ to 2 ft. high; herbage villous and viscid-glandular; leaves of the branchlets linear, entire, ½ to 3 lines long; lowest leaves unknown; branchlets densely leafy, mostly with a single terminal head; heads 5 lines high; rays 4 to 8, yellow, 2½ to 4 lines long; ray-achenes smoothish, stipitate, beaked; disk-flowers about 18; pappus-paleae 8 to 12, linear-lanceolate, unequal, sparsely or somewhat irregularly fibrillose or ciliate, mostly twice as long as the proper tube of the corolla.—Santa Susana Mts., Ventura Co. (T. W. Minthorn, type).

12. **H. wheéleri** Gray. Stem erect, simple below, corymbosely few-branched above, sparsely leafy, 1 to 1½ ft. high; herbage thinly hirsute, or rather densely so on the young parts, and glandular-stipitate above; leaves (the lowest opposite) linear, entire, 1 to 3 in. long; heads 6 to 9 lines broad, solitary or in clusters of 2 or 3 at the ends of the branchlets, leafy-bracteate, the foliaceous bracts twice or thrice surpassing the heads; involucres 2 to 3 lines high; ray-flowers 5 to 12, the rays 2½ to 3½ lines long; ray-achenes compressed with acutish ventral angle and rounded back, not beaked; disk-achenes without pappus.—Montane meadows or sandy flats, 5300 to 9800 ft.: San Jacinto and San Bernardino mountains; Inyo and Tulare Cos. June-Sept. (Madia tenella Greene.)

92. **CALYCADÈNIA** DC. Rosin Weed

Erect annuals. Stems simple, or with virgate branches, or repeatedly branched. Herbage hirsute or hispid, or almost glabrous. Leaves all entire, narrowly linear, becoming filiform by revolution of the margins, at least those near the heads and those of the fascicles in the axils bearing at apex tack-shaped or saucer-shaped glands. Heads oblong or narrow. Receptacle flat, naked in center but with a circle of bracts between disk- and ray-flowers, these bracts more or less united and forming a toothed disk-cup, or at length separating. Flowers white or yellow. Ray-flowers few (1 to 5 or 8), the ligules broad and palmately 3-lobed or -parted; ray-achenes obovoid-triangular, the areola at summit quite or nearly in the center; pappus none. Disk-flowers enclosed in the disk-cup; disk-achenes with conspicuous paleaceous pappus. (Greek kalux, covering, and adenos, a gland, on account of the glands on the involucre.)

Rays 5 to 8; flowers yellow; plants for the most part very glabrous, the smaller leaves with tack-shaped glands at apex ..... 1. *C. truncata.*
Rays 1 to 5.
  Stems repeatedly branched; branches filiform.
    Ray-flowers 1 or 2; disk-flowers 3; uppermost and axillary leaves bearing tack-shaped glands ..... 2. *C. pauciflora.*
    Ray-flowers 3 to 5; disk-flowers 5; tack-shaped glands entirely lacking ..... 3. *C. tenella.*
  Stems simple or with virgate branches.
    Floral and upper leaves tipped with a tack-shaped gland; pappus-paleae mostly 10 to 11.
      Leaves alternate or the lowest crowded but not opposite and sheathing.
        Floral leaves subterete or revolute-terete, truncate at tip.
          Disk-cup not glandular (except no. 4); rays trifid or deeply lobed.
            Ray-achenes hairy.
              Flowers white ..... 4. *C. villosa.*
              Flowers yellow ..... 5. *C. hispida.*
            Ray-achenes glabrous.
              Peduncles or branchlets sparsely leafy; corolla-lobes hispidulose ..... 6. *C. ciliosa.*
              Peduncles or branchlets densely imbricated with leaves; corolla-lobes barely pubescent.... 7. *C. spicata.*
          Disk-cup glandular; rays 3-toothed, the teeth unequal; disk-flowers pink or carmine, the rays white or pink; pappus-paleae as long as corolla, not awned..... 8. *C. bicolor.*
        Floral leaves plane or merely revolute-edged; pappus-paleae unequal; flowers white ..... 9. *C. multiglandulosa.*
      Leaves, at least the lowest, sometimes all, opposite, the lowest connate into sheaths 1 to 2 lines long..... 10. *C. oppositifolia.*
    Floral and upper leaves bearing large greenish saucer-shaped glands, but not tipped with a gland; pappus-paleae 5 or 6; rays commonly yellow, sometimes white ..... 11. *C. mollis.*

1. **C. truncàta** DC. Rosin Weed. Stem erect, reddish brown, ½ to 3 ft. high, simple below, branching above into a panicle of long straight slender branches along which the heads are scattered; herbage glabrous or the leaves and outer involucral bracts somewhat hirsute or hirsute-ciliate; leaves linear, entire, 1 to 2 in. long, or the upper reduced and bract-like; smaller leaves with glands at apex; heads oval, 4 to 6 lines high; rays 5 to 8, broad, 4 to 5 lines long; ray-achenes glabrous, triangular, roughish; disk-flowers 10 to 20; pappus of 7 to 10 unequal oblong fimbriate paleae shorter than the achene, or rarely obsolete.—Dry hills, 500 to 3000 ft.: Coast Ranges from Mt. Hamilton to Shasta Co., thence se. in the Sierra Nevada to Mariposa Co.; n. to Ore. July-Oct. (Hemizonia truncata Gray.) Var. scabrélla Jepson n. comb. More slender, the heads fewer flowered, 2½ to 3 lines high; involucral bracts glabrous or bristly-ciliate and somewhat hispid; pappus lacking.—Dry hills, 500 to 3000 ft.: Santa Lucia Mts. to Shasta Co., thence se. to Placer Co. June-Sept. (Hemizonia scabrella Drew.)

2. **C. pauciflòra** Gray. Stem erect, freely branching above the base, 10 to 18 in. high, the branches simple or dichotomous; herbage sparingly hairy, the leaves (particularly about the heads or of the axillary fascicles) stipitate-glandular; leaves linear, 3 to 6 lines long; heads cylindric or narrowly oblong, scattered singly along the branches and terminal, rarely in clusters of 2; flowers white or rose-tinged; rays 1 or 2, 3-parted, 1 to 1½ lines long; bracts of receptacle 3 to 5, joined into a cylindric cup lobed at apex and containing 3 or 4 flowers; disk-achenes pubescent; pappus of 5 subulate awns and 5 small paleae, the paleae commonly truncate, often fimbriolate; ray-achenes glabrous, smooth, carinate dorsally, with a short stout but obscure stipe, the enclosing bract more or less villous-ciliate.—Dry hill slopes, 500 to 2000 ft.: inner North Coast Range from the Vaca Mts. to Lake and w. Colusa Cos.; Eldorado Co. July-Aug. (Hemizonia pauciflora Gray.) Var. élegans Jepson n. comb. More slender, the branches more numerous and zigzag; leaves filiform; heads mostly in the forks or terminal.—Lake Co. to Glenn and Colusa Cos. May-July. (C. elegans Greene.)

3. **C. tenélla** (Nutt.) T. & G. Stem erect, 6 to 12 in. high, repeatedly branched above the base, forming a broad cymose-paniculate plant, the branches and branchlets slender or wiry, the ultimate branchlets ending in a single head; leaves linear, ¾ to 1½ in. long, the upper tending to be filiform and 3 to 8 lines long, all or nearly all ciliate with long white hairs; heads subtended by a few bract-like leaves; involucres 2 to 2½ lines high; rays white with a central transverse purple spot; ray-achenes 3 to 5, rugose, with a median dorsal nerve, beaked, substipitate; disk-achenes 5; pappus of 4 or 5 subulate awns, scabrous, as long as the corolla, alternating with as many paleae ⅓ to ½ as long; paleae oblong, truncate, finely lacerate at apex.—Dry hills and valleys, 300 to 1200 ft.: coastal S. Cal. May-June. (Hemizonia tenella Gray.)

4. **C. villòsa** DC. Stems 1 or several from the base, rigidly erect, simple or branching, 6 to 13 in. high, hirsute and glandular-puberulent; leaves filiform-linear, hirsute-ciliate, ½ to 3½ in. long, chiefly in a dense basal tuft; upper and floral leaves thick, tipped with a stipitate gland and also somewhat stipitate-glandular; heads shortly peduncled or sessile in the leaf-axils from below the middle and thus spicate; bracts of the involucre tipped with a stipitate gland, densely hirsute-ciliate; disk-cup more or less glandular towards the top; flowers yellow or white and pinkish- or purplish-tinged; ray-flowers 1 to 3, the rays 2 to 3 lines long; disk-flowers about 7 to 9, with glandular-hispidulous corolla-lobes; ray-achenes hairy, carinate-ridged on back; disk-achenes hairy; pappus-paleae 11 to 13, subulate, about ½ as long as corolla.—Plains and open hills, 100 to 3500 ft.: San Joaquin Valley; inner South Coast Ranges from Contra Costa Co. to Monterey, San Luis Obispo and n. Santa Barbara Cos. Aug.-Oct. (Hemizonia villosa Jepson. H. douglasii Gray.)

5. **C. hìspida** Greene. Stem stout, robust, erect, densely leafy at base, 1½ to 2 ft. high, densely clothed above with short or sometimes long branchlets, the branchlets densely leafy; heads terminating the branchlets or racemose

on the branches; floral leaves many; leaves and bracts with apical and a few stipitate glands; rays 3 to 5, broad, yellow, 2½ to 3 lines long; ray-achenes densely villous with appressed hairs; disk-flowers about 10; pappus-paleae about 10, lanceolate, as long as the corolla or nearly.—Plains, Merced Co. Sept. (Hemizonia villosa var. hispida Jepson.)

6. **C. ciliòsa** Greene. Stem erect, simple or with long slender branches above the base or from the middle, 1½ to 2½ ft. high, densely leafy at base; herbage villous-pubescent with ascending hairs, sometimes quite glandular, the axillary branchlets sometimes white-villous; leaves linear, ½ to 1½ in. long; leaves of the axillary fascicles 3 to 6 lines long; floral leaves white-ciliate, tipped with a stipitate gland; heads ovate, 4 to 5 lines high, subsessile and racemose along the branches; disk-cup conspicuously white-villous, its bracts 8 to 10; flowers yellow or white; rays 3 or 5, trefoil-shaped, about 1 line long; ray-achenes smooth, glabrous, with a sharp dorsal keel; disk-flowers about 10; corolla-lobes glandular-hispidulose; pappus-paleae reddish brown, about 10 to 17, ovate or oblong, acute or truncatish, not awned, about ⅓ as long as the corolla.—Dry slopes in the foothills, 500 to 2500 ft.: Lake and Mendocino Cos. to Shasta Co., thence se. in the Sierra Nevada foothills to Butte Co.; n. to southern Ore. July-Sept. (Hemizonia ciliosa Jepson.)

7. **C. spicàta** Greene. Similar to C. villosa; axillary branchlets and peduncles densely imbricated with terete leaves 1 to 3 lines long; corolla-lobes weakly pubescent.—Lower Sierra Nevada foothills from Eldorado Co. to Madera Co. Aug. (Hemizonia villosa var. spicata Jepson.)

8. **C. bícolor** Greene. Stem erect, simple or branched above the base, 8 to 12 in. high, sparsely leafy, the heads sessile or short-peduncled in the axils from above the middle and thus loosely spicate; herbage subcanescent, only slightly hirsute; leaves filiform, 1 to 4½ in. long, those of the axillary fascicles ciliate, gland-tipped and somewhat stipitate-glandular, 1 to 3 lines long; heads 3 to 3½ lines high; bracts of the cup 5 (or 6 to 7); ray-flowers 3 (1 to 4), the rays white, varying to pink or carmine, 3 to 4½ lines broad, 3-toothed, broader than long, central tooth acute, the lateral rounded, much larger; ray-achenes hairy; disk-flowers 3 to 8, pinkish, their achenes hairy. Dry hills, 500 to 4500 ft.: Sierra Nevada foothills from Nevada Co. to Fresno Co. May-July. (Hemizonia bicolor Jepson.)

968. Calycadenia multiglandulosa DC.; *a*, fl. branchlet x ½; *b*, ray-fl. x 2; *c*, disk-fl. x 2; *d*, achene and pappus x 2.

9. **C. multiglandulòsa** DC. Fig. 968. Stem erect, simple or sometimes freely branched, 6 to 16 in. high; herbage with a pleasant balsamic odor, sparingly hirsute or hispid, especially toward the base of the leaves; floral leaves and involucres glandular with stipitate glands; leaves narrowly linear to filiform, mostly straight and rigid but brittle, 1 to 3¼ in. long, the upper somewhat divaricately spreading and mostly 2 or 3 times longer than the heads and floral leaves in the axils; leaves of the axillary fascicles 3 to 4 lines long; heads solitary in the axils or 2 or 3 in clusters on short axillary branchlets or crowded towards or near the summit and spicate; flowers white; ray-flowers 1 to 3; disk-flowers about 5; pappus-paleae commonly 10, some (commonly 5) lanceolate or subulate, others (com-

monly 5) shorter and often blunt; disk-achenes appressed-villous; ray-achenes glabrous, somewhat rugulose-channeled or -pitted on back, also on face either side of the median linear scar.—Dry open hills, 20 to 3000 ft.: Coast Ranges from Mt. Hamilton Range and Santa Cruz Mts. to Marin, Napa and Humboldt Cos. July-Sept. (Hemizonia multiglandulosa Gray.) Var. CEPHALÒTES Jepson n. comb. Heads in a terminal capitate cluster.—Marin Co. to Lake Co. (Hemizonia multiglandulosa var. cephalotes Gray.)

10. **C. oppositifòlia** Greene. Stems erect, slender or wiry, 1 or several from or near the base, simple or sparingly branched, 3 to 13 in. high, a little canescent; leaves all or the lowest opposite, narrowly or elongated linear, scaberulous, ciliate at base, 1 to 2½ in. long, the lowest ones connate at base into membranous sheaths 1 to 2 lines long; leaves of the axillary fascicles crowded, 2 to 3 lines long, gland-tipped; floral leaves 2 to 4 times exceeding the heads; heads in dense terminal clusters or sometimes racemose along the branches; flowers white, sometimes purple on same plant; ray-flowers 2 or 3, the rays parted nearly to the base into 3 elliptic or obovate lobes, 3 to 3½ lines long; bracts of disk-cup 5, the disk-cup enclosing 4 to 8 flowers; ray-achenes smooth, slightly carinate on back, bearing a very short thick beak at summit; pappus-paleae subulate, awned, about ½ as long as corolla, with about as many short bluntish paleae; disk-achenes a little hairy.—Dry flats or grassy slopes in the foothills, 400 to 1500 ft.: Sierra Nevada foothills from Tulare Co. to Butte Co.; Lake Co. to e. Humboldt Co. June-July. (Hemizonia oppositifolia Jepson. H. multiglandulosa var. sparsa Gray.)

11. **C. móllis** Gray. Stem erect, simple or more commonly with long paniculate branches, 13 to 22 in. high; herbage cinerulous or villous; leaves narrowly linear, 1 to 2½ in. long, rather strictly erect; heads 2 or 3 in small clusters, the clusters racemosely disposed in short branchlets and terminal; bracts and floral leaves sprinkled with large saucer-shaped greenish glands; flowers yellow (or white); ray-flowers 3, the rays 2½ lines long, much broader than long; ray-achenes glabrous, smooth but irregularly a little channeled transversely; bracts of the disk-cup 5; disk-flowers about 8, their achenes a little pubescent; pappus-paleae 4 to 6, attenuate to an awn, ¾ as long as the corolla, with 2 or 3 short ones at base.—Montane slopes or flats, 2000 to 4000 ft.: Tuolumne Co. to Fresno Co. June-July. (Hemizonia mollis Gray.)

93. **BLÉPHARIZÒNIA** Greene

Stout annuals with glandular-viscid ill-scented herbage. Cauline leaves linear and entire, those of the branches oblong to oval. Flowers yellow, the heads arranged in panicles. Ray-flowers 7 to 10, with 3-lobed ligules; disk-flowers 10 to 25, the outer ones subtended by 1 or 2 series of linear bracts. Achenes silky-hirsute, 10-striate; those of the disk more or less fertile, crowned by a pappus of about 15 to 18 short and stout densely plumose awns; those of the ray fertile, elongated-turbinate, the pappus like that of the disk or minutely setulose. (Greek blepharis, an eyelash, and zonia, a girdle, in reference to the circle of pappus-awns.)

1. **B. plumòsa** (Kell.) Greene. Stem erect, freely branched, 2 to 3 ft. high; leaves, stems and involucres copiously beset with tack-shaped glands, the stems also glandular-puberulent; leaves on the branchlets small and bract-like; heads 15 to 20-flowered, paniculately disposed; bracts of the involucre short; ray-achenes with a minute crown of short scales; disk-achenes with nearly erect plumose bristles as long as the achene.—Fields and stream beds, 10 to 50 ft.: Stockton; Antioch; Los Medanos. Aug.-Oct. Var. SUBPLUMÒSA Jepson n. comb. Stem 3 to 6 ft. high; heads larger, borne singly at the ends of the branches, 20 to 25-flowered; pappus of disk-achenes short and spreading, less plumose, only ⅓ as long as the achene; ray-achenes similar.—Sierra Nevada foothills in Tuolumne Co.; lower San Joaquin Valley (Hemizonia plumosa var. subplumosa Gray.)

94. MÀDIA Mol. Tarweed

Erect annuals or perennial herbs with glandular-viscid heavy-scented herbage. Leaves, at least the upper, alternate, entire or serrulate. Heads axillary and terminal. Flowers yellow, opening in the evening and closing before noon of the next day. Involucre angled by the salient carinate or almost conduplicate bracts. Bracts in 1 series, completely enfolding the laterally compressed ray-achenes, and with free moderately long or short tips. Receptacle flat or convex, bearing a single row of chaffy bracts between ray- and disk-flowers, these bracts often united and forming a disk-cup. Disk-corollas in ours more or less pubescent. Rays few to many, 3-lobed. Bracts of involucre deciduous with the mature ray-achenes. Ray-achenes not beaked (except in nos. 4 and 9). Disk-achenes fertile or abortive. Pappus commonly none in ray-achenes, sometimes present in the disk-achenes. (Madi, the Chilian name.)

Perennials (sometimes biennials); rays well exserted, conspicuous, without pappus; disk-flowers with manifest pappus.
  Heads with only the ray-achenes fertile; involucre 2½ to 3 lines high; plants slender. 1. *M. madioides.*
  Heads with outer disk-achenes fertile; involucre 4 to 6 lines high; plants stout. 2. *M. bolanderi.*

Annuals; pappus none in both disk and ray except no. 5.
  Disk-flowers few to many.
    Rays well exserted, conspicuous.
      Receptacle fimbrillate-hirsute; ray-achenes very slightly if at all curved; pappus wanting or rudimentary. 3. *M. elegans.*
      Receptacle naked; ray-achenes incurved.
        Pappus absent; plants stout; rays 4 to 8 lines long. 4. *M. radiata.*
        Pappus present in both ray and disk; plants slender; rays ½ to 2½ lines long. 5. *M. yosemitana.*
    Rays usually little or not at all exserted, inconspicuous; receptacle naked; ray-achenes curved.
      Involucre suborbicular or broader than long; heads 3 to 6 lines high; plants (½ or) 1 to 4 ft. high.
        Plants stoutish, viscid-glandular (at least above); heads in clusters. 6. *M. sativa.*
        Plants slender, moderately glandular; heads scattered.
          Bracts of the disk-cup distinct. 7. *M. dissitiflora.*
          Bracts of the disk-cup united. 8. *M. citriodora.*
      Involucre elongate, longer than broad. 9. *M. glomerata.*
  Disk-flower 1; heads 1 to 1½ lines high; plants 4 to 7 (or 12) in. high. 10. *M. exigua.*

1. **M. màdioides** (Nutt.) Greene. Woodland Madia. Stems 1 or several, slender, erect, simple, arising from a perennial (or biennial) root, 1 to 2¼ ft. high, ending above in a terminal corymbose cyme; herbage hirsute below, glandular above; some or most of the leaves opposite, linear, a few varying to lanceolate, entire or denticulate, 1½ to 4 in. long, chiefly basal and on lower part of stem, much reduced above; cyme consisting of a few long slender and nearly naked branches; bracts of the involucre 8 to 12, with short tips; rays acutely 3-lobed, 3 to 5 lines long; ray-achenes fertile, much flattened, curved and somewhat obovate, the surface covered with minute muriculations and the sides with many striae, the pappus represented by a mere crown; disk-flowers sterile, the pappus of very short fimbriate or hairy paleae.—Woods near the coast from Monterey Co. to Humboldt Co.; n. to B. C. June-July. (M. nuttallii Gray.)

2. **M. bolánderi** Gray. Stem stout, erect, simple below, ending above in a corymbose cyme, 1½ to 3 ft. high, arising from a rootstock which also bears a few short stolons with leafy tufts; herbage hirsute below, glandular-hirsute above; leaves linear, entire, 3 to 7 (or 10) in. long, 2 to 4 lines wide; heads few in the corymb, long-pedunceled; involucres campanulate, 4 to 6 lines high; bracts and rays 12 to 16; bracts of the receptacle linear and unconnected; ray-achenes linear-falcate, 1 or 2-nerved on the narrow faces, finely muriculate, commonly with a rudiment of pappus; disk-achenes numerous, straighter, hispid, outer ones fertile, all with a pappus of slender hirsute-ciliate paleae, these disk paleae shorter, sometimes much shorter than the corolla.—Montane woods, 4000 to 6350 ft.: Sierra Nevada from Mariposa Co. to Plumas Co.; n. to Modoc Co., thence w. to Siskiyou Co. July-Aug.

3. **M. élegans** Don. COMMON MADIA. Fig. 969. Stem erect, simple below the corymbose inflorescence, ¾ to 2 ft. high; herbage hispid or hirsute, more or less viscid above with short gland-tipped hairs, the involucres and peduncles more or less hirsute with white hairs; lower leaves linear, entire or obscurely denticulate, 3 to 5 in. long, short-hirsute, often densely so; upper leaves much reduced in size, linear-lanceolate; heads few to many, long-peduncled in a corymbose panicle; bracts long-tipped; receptacle convex, fimbrillate-hirsute; rays 9 to 15, 4 to 8 (or 11) lines long, yellow or with a red spot at base; achenes flattish, light brown or blackish, muriculate.—Dry hillsides and valley flats, 2000 to 3500 ft., common: throughout cismontane Cal. in the hills and mts.; n. to Ore., e. to Nev. June-Aug. (M. corymbosa DC.) Var. DENSIFÒLIA Jepson. Taller; leaves densely crowded toward the base or tufted. —With the species. Var. HÍSPIDA Hall. Herbage villous with long spreading hairs, the hairs not glandular; involucres and peduncles densely villous or almost shaggy; leaves commonly opposite; rays 4 to 5 lines long.—Kern Co. to n. Cal. June. (M. hispida Greene.)

969. Madia elegans Don; *a*, fl. branchlet x ½; *b*, head x 1; *c*, disk-fl. x 2; *d*, ray-fl. x 2.

4. **M. radiáta** Kell. Stem usually stout, erect, leafy, branching from about the middle, 1½ to 3 ft. high; herbage short-hirsute and viscid; lower leaves lanceolate, slightly and remotely denticulate, 2 to 4 in. long, the upper cauline leaves reduced, entire; bracts of the involucre 10 to 20, with short tips; rays light yellow, ½ to ¾ in. long, obtusely 3-toothed; chaffy bracts between ray and disk united; disk-flowers very numerous on a nearly flat glabrous receptacle, fertile except the central ones, somewhat clavate and 4-angular; ray-achenes narrowly obovate-falcate, flat.—Open fields: e. Contra Costa Co. s. to the San Carlos Range. Apr.-May.

5. **M. yosemítàna** Parry. Stems erect, slender, 1 or several from the base, simple below, ending above in a very loose corymb, 9 to 18 in. high, or depauperate forms only 2 to 5 in. high; herbage somewhat hirsute below, the stems and peduncles and upper leaves sparsely glandular; leaves linear, entire, ½ to 2 in. long; heads on long slender peduncles; involucres 1½ to 2 lines high, the bracts with short narrow tips; rays 5 to 10, obtusely 3-cleft, 3 to 4 lines long (in depauperate forms 1 to 2 lines long); disk-flowers 3 to 10, sterile; bracts of the receptacle 4 to 8, more or less connate by their margins; ray-achenes semi-obovate or slightly lunate, the pappus reduced to a ciliolate crown; disk-flowers with a pappus of about 5 sparsely barbellate awns, the awns nearly equaling the corolla.—Gravelly flats in the mts., 2700 to 6200 ft.: Sierra Nevada from Fresno Co. to Eldorado Co. May-July. (M. rammii Greene.)

6. **M. sativa** Molina. CHILE TARWEED. Stem erect, robust, simple or branching above, 1 to 4 ft. high; herbage ill-scented, hairy or more or less glandular-hirsute, the stems and upper parts or sometimes the entire plant beset with pedicellate very viscid glands; leaves from broadly lanceolate to linear, entire, 1 to 2 in. long; heads 4 to 6 lines high, short-peduncled or sessile, disposed in the upper axis and at the ends of short branches; involucres 3 to

3½ lines high, the bracts with lanceolate tips; rays 5 to 12, with pale yellow ligules about 2 lines long; bracts of receptacle united into a campanulate cup and enclosing many disk-achenes, these cuneate-oblong and 4-angled, often prominently 1-nerved on the sides and 2 lines long; ray-achenes somewhat falcate-obovate, either with or without an obvious nerve on the sides.—Waysides and vacant lots of towns and villages, valleys and low hills, common: Coast Ranges and coastal S. Cal.; Sierra Nevada foothills (but less common); doubtless naturalized from Chile. July-Aug. Var. CONGÉSTA T. & G. Stem stout, simple or branching, 1½ to 2½ ft. high; herbage very viscid-glandular, honey-scented; heads larger than in the species, capitate-congested at the ends of the branchlets.—Waste places and fields, w. Cal.; Ore. June-July. (M. capitata Nutt.)

7. **M. dissitiflòra** (Nutt.) T. & G. GUM-WEED. Stem erect, very slender, simple or loosely branching, 1 to 2 ft. high; herbage hirsute with spreading hairs, moderately viscid above, scarcely so below; leaves linear, entire or remotely denticulate, 1½ to 2½ in. long; inflorescence loosely paniculate, the heads 1 to 3 on the ends of the branchlets, sometimes slightly racemose; flowers sulphur-yellow; cup of receptacle ovoid but not closed, containing few disk-flowers; rays 5 to 8, 1½ to 2 lines long; achenes short and broad, more or less compressed, 1 to 2 lines long.—Stream banks, open bushy places or wooded slopes in the mts., 1400 to 7000 ft.: throughout cismontane Cal. June-July. Var. ANÓMALA Jepson n. comb. Herbage fragrant; chaffy bracts of receptacle not joined into a cup, enclosing 3 flowers only; achenes all gibbously obovate, those of the rays 3 to 5.—Marin, Lake and Eldorado Cos. (M. anomala Greene. Hemizonia anomala Gray.)

8. **M. citriodòra** Greene. Stem slender, erect, simple below, ½ to 1¼ ft. high, with short-pedunculate corymbosely panicled heads, or loosely branched above and heads more scattered; herbage villous-hirsute, somewhat glandular above; leaves linear, entire or remotely denticulate, 1 to 3¼ in. long; heads terminal on the branchlets in a corymbose panicle; involucres 2½ to 3 lines high, the 8 or 9 bracts rounded on the back, with the lower part half enclosing the ray-achenes; rays 8 or 9, greenish yellow, ½ line long, little exserted; ray-achenes semi-obovoid, somewhat obcompressed, rounded on the back, 1½ lines long; bracts of the receptacle between disk and ray lightly united into a toothed cup.—Hillslopes, 500 to 2600 ft.: foothills of Sacramento and Eldorado Cos.; Napa Range; Siskiyou Co.; n. to Wash. and Ida. May. Hemizonia citriodora Gray.)

9. **M. glomeràta** Hook. Stem with many branches at or above the base, sometimes simple, rigid, leafy, 6 to 19 in. high; herbage rather densely hirsutulose, glandular only toward the inflorescence; leaves narrowly linear, entire, ½ to 1½ in. long; heads more or less glomerate in a rather narrow or sometimes strict panicle; rays 2 to 5 or sometimes none, not exceeding the few disk-flowers; achenes narrow, 2 lines long, those of the disk 4 or 5-angled; ray-achenes somewhat curved, 1-nerved on each face.—Montane slopes or flats, 6000 to 6700 ft.: Sierra Nevada from Mariposa Co. to Plumas Co.; Modoc Co.; Humboldt Co.; n. to Wash., e. to Col. June-Aug. Var. RAMÒSA Jepson n. comb. Stem usually slender and loosely branched above, less rigid than in the species; heads in a loose cyme or the lower scattered.—Sierra Nevada, 4000 to 7000 ft., from Mariposa Co. to Modoc Co.; n. to Wash. June-Aug. (M. ramosa Piper.)

10. **M. exígua** (Sm.) Greene. Stems slender, paniculately much branched throughout, or often nearly simple, 4 to 7 (or 12) in. high; herbage hirsute, glandular above, sweet-scented; leaves narrowly linear, entire, 4 to 8 lines long; heads solitary on naked filiform peduncles; involucres 1 to 1½ lines high, broader than high, the 4 to 8 bracts lunate and strongly connate with minute tips; rays inconspicuous; bracts of the receptacle united; disk-flowers solitary, sometimes 2; ray-achenes compressed, strongly incurved, shortly beaked.—Open woods in the hills, 100 to 4000 ft., common: throughout cismontane Cal.; Siskiyou Co. to Modoc Co.; n. to B. C. May-June. (Madia filipes Gray. Harpaecarpus exiguus Gray.)

95. LÀYIA H. & A.

Vernal annuals with alternate leaves (or the lowest opposite in one species) and usually showy heads of flowers terminating the branches. Disk-corollas yellow. Ray-flowers 8 to 20, yellow, white, or yellow tipped with white. Bracts herbaceous, the thin margins at base enfolding the achene and usually deciduous with it. Receptacle broad and flat, with a row of thin bracts between ray- and disk-flowers, and sometimes with additional ones among the disk-flowers. Ray-achenes flattened, without pappus, almost always glabrous. Disk-achenes commonly pubescent, with a pappus of 5 to 20 paleae or bristles or rarely none. (G. Tradescant Lay, botanist to the Beechey Expedition which visited California in 1827.)

A. Involucral bracts with tooth-like bristles chiefly on or near the fold where the lower portion is infolded around the achene, the middle portion often glabrous or nearly so; herbage without stipitate glands.

Achenes of both disk and ray glabrous; pappus none.....1. *L. chrysanthemoides.*
Achenes of disk pubescent or hairy; pappus present.....2. *L. calliglossa.*

B. Involucral bracts with hairs or bristles or bristle-tipped teeth uniformly distributed over the surface (in no. 6 sometimes mostly on or near the fold), or at least the middle portion not glabrous; herbage with stipitate glands (except no. 3).

1. Pappus of naked paleae, awns or bristles, not hairy (no. 3 has a few free hairs).

Pappus paleaceous at base.
Peduncles without dark glands; pappus-paleae ovate to broadly lanceolate, awn-tipped. 3. *L. fremontii.*
Peduncles with stipitate dark glands; pappus-paleae not awn-tipped.
Leaves ciliate, mostly lobed or pinnatifid, all alternate; plants 6 to 24 in. high; pappus-paleae ovate or oblong-ovate; San Luis Obispo.....4. *L. jonesii.*
Leaves hispid on upper surface, entire, the lower ones opposite; plants 4 to 7 in. high; pappus-paleae narrowly lanceolate; Napa and Sonoma Cos..... 5. *L. nutans.*

Pappus consisting of bristles, not at all paleaceous.
Rays yellow, white-tipped; pappus of 15 to 20 stout scabrous bristles..... 6. *L. platyglossa.*
Rays golden-yellow; pappus of 5 (or fewer) smooth or non-scabrous bristles or sometimes wanting .....7. *L. pentachaeta.*

2. Pappus of paleae, awns or bristles which are plumose or hairy at base.

Inner hairs of pappus-paleae or bristles woolly and interlaced (except in no. 9, var. heterotricha); rays showy (except in no. 9, var. hispida).
Rays yellow (rarely white-edged); pappus of stout barbellate bristles....8. *L. elegans.*
Rays white; pappus of narrowly lanceolate-subulate paleae.....9. *L. glandulosa.*
Hairs of pappus-paleae or bristles straight (no woolly inner ones).
Rays white or pink; herbage pubescent to glabrate (except no. 10); stems uniformly colored, not brown-spotted.
Rays 1 to 3 lines longer than bracts; leaves not succulent; pappus of narrowly lanceolate-subulate paleae with rather few hairs all near the base..... 10. *L. douglasii.*
Rays scarcely longer than bracts; leaves succulent; pappus of bristles plumose to above the middle; seashore .....11. *L. carnosa.*
Rays yellow or yellow and white; herbage hispid, the stems often brown-spotted at base of the bristles (except in no. 12).
Rays showy, 4 to 7 lines long.
Leaves all entire (rarely toothed); rays lemon-yellow or cream-color..... 12. *L. graveolens.*
Leaves not all entire; rays yellow or white above the middle in var.; pappus-bristles twice or little longer than the soft basal hairs..... 13. *L. gaillardioides.*
Rays short, 1 to 2 (or 3) lines long.....14. *L. hieracioides.*

1. **L. chrysánthemoìdes** (DC.) Gray. Fig. 970. Stems 1 or several from base, erect or somewhat spreading, 4 to 14 in. high, glabrous below, the upper portion pubescent; leaves oblong, pinnately cleft or parted or the upper linear and entire, ½ to 2 in. long, hispid-ciliate; involucres 3½ to 4½ lines high, the upper portion of the bracts linear-attenuate and shortly hispid-ciliate, the lower portion broader and strongly hispid-serrate along the marginal fold where infolded around the achene; bracts of receptacle with dark tips; achenes glabrous, elongate-obovate, without a disk at summit; pappus none.—Region of San Francisco Bay.

2. **L. calliglóssa** (H. & A.) Gray. Similar in habit to no. 1; herbage comparatively glabrous, the stems for the most part puberulent only above and

970. Layia chrysanthemoides Gray; *a*, fl. branchlet x 1; *b*, disk-fl. x 2; *c*, *d*, achenes x 2.

the leaves usually only finely ciliate; leaves ½ to 3 in. long, the lower ones pinnately parted or lobed, the upper entire; most disk-flowers with dark-tipped chaffy bracts; achenes villous-pubescent or partly glabrate; pappus of about 10 to 18 lanceolate, unequal and rigid subulate awns, which are somewhat scabrous or slightly hirsute near the dilated or paleaceous base, the marginal ones rather shorter than the corolla, the smaller hardly half as long.—Region of San Francisco Bay, common. (Calliglossa douglasii H. & A., 1840, but not L. douglasii H. & A., 1840.) Var. ÓLIGOCHAÈTA Gray. Lower leaves often less lobed; pappus of only 2 slender (and often short) marginal awns or with some intervening rudiments.—Marin, Sonoma and Napa Cos. May-June.

3. **L. fremóntii** Gray. Stems 1 to several from base, simple or branched, ½ to 1 ft. high; herbage minutely pubescent; leaves mostly pinnately parted, ½ to 1¾ in. long; heads 1 to 1¼ in. broad; rays white, 5 to 8 lines long; pappus-paleae ovate- to oblong-lanceolate, tapering into a subulate awn, nearly equaling the corolla, the margin entire, accompanied by some long villous free hairs.—Upper Sacramento Valley; Sierra Nevada foothills from Eldorado Co. to Tuolumne Co. Apr.-May.

4. **L. jònesii** Gray. Stem usually simple below, branching above, ½ to 2 ft. high, stipitate-glandular; leaves hispidulous-ciliate, narrowly linear, pinnatifid, ½ to 2½ in. long, or the upper ones often entire; heads ¾ to 1 in. broad; involucres 3 to 4 lines high; rays 2½ to 3 lines long; receptacle with only marginal bracts; paleae of the pappus ovate or oblong-ovate, acuminate, often erose-denticulate, about equaling or little longer than the proper corolla-tube.—San Luis Obispo Co.

5. **L. nùtans** (Greene) Jepson. Stem 4 to 7 in. high, the branches slender and divergent; herbage hirsute, especially the leaves, the stems reddish brown; leaves linear, all entire, the lower pairs opposite; peduncles somewhat stipitate-glandular; heads 5 to 7 lines broad, erect in flower, nodding in bud and fruit; rays 5 to 7, yellow, 2½ to 3½ lines long; achenes 1½ lines long, hispidulous; pappus-paleae narrowly lanceolate, acuminate, 8 to 10, unequal, with barbellate margins.—Mountain slopes: Napa Range; Hoods Peak Range. May.

6. **L. platyglóssa** (F. & M.) Gray. TIDY TIPS. Fig. 971. Stem simple or more commonly branching below, erect or sometimes diffuse, 4 to 16 in. high; herbage short-hirsute and stipitate-glandular; leaves linear and entire or the lower commonly pinnatifid into short linear or oblong

971. Layia platyglossa Gray; *a*, fl. branchlet x 1; *b*, fl. x 2.

lobes; peduncles turbinate-thickened beneath the heads; heads 1 to 1¾ in. broad; involucral bracts linear, denticulate-ciliate on the lower half; rays 13, 5 to 6 lines long, sulphur-yellow, the tips white; disk-achenes somewhat flattened, 1½ lines long, densely clothed with upwardly pointing silky hairs; pappus-bristles 15 to 20, nearly as long as the corolla.—Valleys and foothills, 100 to 4600 ft.: throughout cismontane Cal.; w. side Colorado Desert. Apr.-May. Var. BREVISÈTA Gray. Pappus only ½ as long as the corolla.—Los Angeles Co. to San Luis Obispo Co.

7. **L. pentachaèta** Gray. Stem slender, erect, paniculately branched, 1 to 2 ft. high; herbage somewhat hirsute and viscid-pubescent; stipitate glands minute and sparse; cauline leaves mostly pinnatifid or the lower laciniately bipinnatifid, the lobes narrowly linear; rays golden- or orange-yellow, ample, ½ in. or more long; disk-achenes minutely pubescent or glabrate; pappus of 5 or rarely fewer rigid and smooth bristles, or sometimes none (ex char.).—Stanislaus Co. foothills. Obscure and too little known plant.

8. **L. élegans** (Nutt.) T. & G. Stem simple or diffusely branched, 8 to 11 (or 24) in. high; herbage short-hispid, the stems often brown-dotted; stipitate glands small and scattered; leaves linear, 1 to 3 in. long, the lower pinnately toothed or parted; rays yellow, 6 to 9 lines long, sometimes white-edged; pappus white or sordid, the villous hairs copious but much shorter than the barbellulate awn-like bristles.—Plains and foothills, 300 to 1500 ft.: coastal S. Cal.; Napa Co.; Mendocino Co.; s. to L. Cal. Apr.-May.

9. **L. glandulòsa** (Hook.) H. & A. Stem simple or commonly branching from the base, erect or diffuse, 5 to 10 (or 14) in. high; leaves and stems (particularly near the heads) with scattered or abundant stipitate dark glands, more or less hispid with white hairs; leaves lanceolate or linear, ½ to 1¼ in. long, the lower pinnatifid or toothed, the upper entire; heads 1 to 1½ in. broad; involucres 4 lines high; rays 8 to 10, pure white, 5 to 7 lines long; pappus bright white, of 10 to 12 scabrid narrowly lanceolate-subulate paleae, with straight hairs toward the base outside and woolly tangled hairs inside; achenes 1½ to 2½ lines long.—Plains and foothills, 50 to 1500 ft.: throughout cismontane Cal.; w. side Mohave Desert; Modoc Co.; n. to B. C. Apr. Var. HETERÓTRICHA Hall. Stem simple or branched, ½ to 2 ft. high; herbage often rough-hispid; rays 10 to 18; inner woolly hairs of pappus wanting.—Sandy fields: Lake Co.; San Joaquin Valley; Tulare Co.; Kern Co.; Mohave Desert; Inyo Co. (Madaroglossa heterotricha DC.) Var. HÍSPIDA Jepson n. comb. Stems simple or branched from the base, 4 to 12 in. high; herbage densely hispidulous throughout; leaves narrow, all entire; involucres 4 lines high; rays white, 3 to 4 lines long; pappus-bristles 10, slender, bearing copious short interlaced hairs.—Mt. Diablo; Kern Co.; San Diego Co. (L. hispida Greene.)

10. **L. douglásii** H. & A. Stems usually branched from base, 4 to 10 in. high; herbage hirsute or hispid, above somewhat stipitate-glandular; basal leaves oblong, toothed or pinnatifid, 1 to 1½ in. long, the cauline narrowly oblong to linear, entire, 3 to 7 lines long; rays white, broad, surpassing the involucral bracts by 1 to 3 lines; disk-achenes villous; pappus of narrowly lanceolate-subulate paleae with scabrous margins and rather few soft hairs toward base.—East side Sierra Nevada from Inyo Co. to Lassen Co.; n. to B. C., e. to Nev. Near no. 9.

11. **L. carnòsa** T. & G. BEACH LAYIA. Stem diffusely branched, 3 to 9 in. high, somewhat pubescent, with a few scattered stipitate glands, basal leaves 1 to 1½ in. long, succulent, spatulate to linear-oblong, toothed, those of the branches narrower, rarely toothed; heads 3 to 4 lines broad; rays ½ line long; pappus-bristles 23 to 28, sparsely plumose with straight soft hairs; bracts of the receptacle ciliate; disk-achenes thickly covered with short hairs; ray-achenes puberulent, sometimes glabrous.—Seabeach sands: Humboldt Co. to Monterey Co.

12. **L. gravèolens** Greene. Stem very stout, commonly simple below, sparingly branched above, 1 to 1⅔ ft. high; herbage short-villous and with numerous black stipitate glands, sometimes succulent and nearly glabrous; leaves lanceolate to linear-lanceolate, obtuse, rarely toothed, ½ to 2½ in.

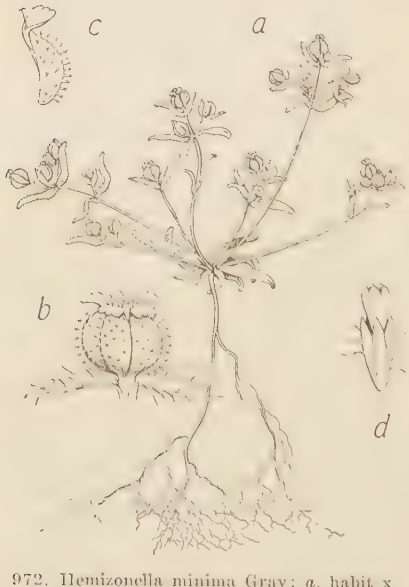
long; heads 1½ to 2 in. broad; involucres 3½ to 6 lines high; rays lemon-yellow or cream-color, 5 to 7 lines long; achenes slenderly clavate; pappus bright white or often sordid, its bristles 15 to 20 with straight erect hairs.—Foothills, 1000 to 5000 ft.: Tehachapi Range; Mt. Pinos; San Carlos Range.

13. **L. gaillárdioides** H. & A. Stem rather freely branching, 8 to 24 in. high, hispid, the stems dark-dotted; leaves narrowly or broadly linear, more or less laciniate-pinnatifid, or the upper entire; heads ¾ to 1½ in. broad; rays orange-yellow, 4 to 9 lines long; pappus dull white or rusty, the bristles 15 to 20, twice as long as or little exceeding the soft basal hairs.—Humboldt Co. to the upper San Joaquin Valley. Var. NEMORÒSA Jepson. Leaves entire or sparingly dentate, the larger ¼ to 1 in. broad; rays white, pale yellow below the middle.—San Mateo, Contra Costa and Marin Cos. (Blepharipappus nemorosus Greene.)

14. **L. hieracioides** (DC.) H. & A. Coarse erect plant, 2 to 3 ft. high; stem mostly simple below and branching above, hispid with hairs arising from dark spots; herbage with dark stipitate glands; lower leaves oblong, 2 to 4 in. long, 3 to 9 lines wide, laciniate-dentate, usually somewhat narrowed at base; upper leaves broadest at the sessile base, the teeth fewer and mostly towards the apex; heads 5 to 7 lines broad; rays yellow, short, little exceeding the disk; pappus-bristles about 15.—Wooded hill slopes, 500 to 1500 ft.: Mendocino Co. to Santa Barbara Co. May-June.

96. **HEMIZONÉLLA** Gray

Low annual. Leaves mainly opposite, narrow, entire. Stems somewhat dichotomously branched. Heads subsessile or shortly peduncled in small clusters, or with longer peduncles and solitary. Bracts of the involucre 4 or 5, broad on the back, the margins infolded for their whole length and completely enclosing the ray-achenes. Bracts of the receptacle united into a 3 to 5-toothed cup surrounding the 1 to 4 disk-achenes. Flowers minute, yellow. Ray-achenes fertile, obcompressed, incurved. Pappus none. (Diminutive of Hemizonia, in allusion to the relationship and size of these plants.)



972. Hemizonella minima Gray; *a*, habit x ⅔; *b*, head x 2; *c*, ray-fl. with involucral bract x 3; *d*, disk-fl. x 3.

1. **H. mínima** Gray. Fig. 972. Stems 1 and erect to several, divergently and more or less dichotomously branched, 1 to 4½ in. high, arising from a rosette of basal leaves; herbage villous-hirsute, the upper parts and the involucres stipitate-glandular; leaves sessile, 2 to 7 lines long, the basal ones linear-spatulate, the cauline ones linear; involucres 1 to 1½ lines high.—Montane slopes and ridges, 3500 to 8000 ft.: mts. of coastal S. Cal.; Sierra Nevada from Tulare Co. to Shasta Co.; Humboldt Co. to Siskiyou Co. Apr.-July. (H. parvula Gray. H. durandi Gray.)

97. **LAGOPHÝLLA** Nutt.

Villous or hirsute annuals with rigid and brittle stems. Leaves alternate or the lower opposite, mostly entire. Flowers pale yellow. Heads small, subtended by foliaceous bracts. Bracts of the involucre 5, thin-herbaceous, flat on the back, with margins at base infolded and completely enclosing an

obcompressed achene, with which it is deciduous. Receptacle small and flat, bearing about 5 perfect disk-flowers, these surrounded by a single row of distinct chaffy bracts. Rays 5, cuneate, palmately 3-cleft. Achenes glabrous; ray-achenes obcompressed, obovate-oblong, smooth, nearly straight, pointless; disk-achenes slender, sterile. Pappus none. Bracts and achenes all deciduous at maturity. (Greek lagos, a hare, and phullon, leaf, the upper leaves sometimes copiously villous on the margin.)

Herbage canescent; rays ½ to 2 lines long, usually little exserted; lower leaves early deciduous.....1. *L. ramosissima.*

Herbage not canescent; rays fanshaped or nearly, 4 to 5 lines long, nearly as wide, usually much exserted; lower leaves less promptly deciduous.

Stems racemosely or paniculately branched above; involucre and often the branchlets sprinkled with tack-shaped glands, its inner bracts greenish or stramineous; achenes carinate down the ventral face; cauline leaves linear.....
2. *L. glandulosa.*

Stems more or less falsely dichotomously paniculate; herbage non-glandular, the inner bracts of the involucre dusky; achenes without nerve or keel on ventral face; cauline leaves spatulate.....3. *L. dichotoma.*

1. **L. ramosíssima** Nutt. Stems 1 or several from the base, erect, simple below, commonly paniculately branched above, or essentially simple throughout, 1 to 1¼ ft. high; leaves (especially the upper) silky-hirsute, the short ones subtending the heads densely villous-ciliate; leaves oblanceolate or linear-lanceolate, often narrowed at base to a slender petiole, the whole 1 to 2½ in. long, often becoming concave or involute when dry; heads almost sessile, borne in small crowded clusters on the ends of the leafy branchlets or racemose along them; rays commonly barely exserted, pale yellow; fertile achenes carinately 1-nerved down the inner face.—Dry hills and plains, 100 to 3200 ft.: common throughout cismontane Cal. except in the Redwood belt; Lassen Co. to Siskiyou Co.; e. to Nev., n. to Wash. and Ida. May-Aug. Var. CONGÉSTA Jepson. Stem robust, nearly simple with very short branches, or much branched, 1 to 3 ft. high; heads larger, in thick glomerules.—Dry hill slopes and valleys, 1000 to 2500 ft.: Mt. Hamilton; North Coast Ranges from Marin and w. Solano Cos. to Humboldt and Lake Cos.; Sierra Nevada foothills from Calaveras Co. to Eldorado Co. (L. congesta Greene.)

2. **L. glandulòsa** Gray. Stem erect, slender, with racemose branches or paniculately branched, 1 to 2¼ ft. high, villous or glabrate, the leaves cinereous-puberulent; leaves linear, entire, sessile, ½ to 1¼ in. long, the basal ones linear-oblanceolate, entire or obscurely serrulate, narrowed to a short or long petiole, the whole ¾ to 3 in. long; involucres and occasionally the small upper leaves and the branchlets sprinkled with small tack-shaped glands, or sometimes these absent; bracts of the involucre and the outer supplementary bracts resembling the ordinary leaves, inconspicuously if at all ciliate; achenes nearly as in no. 3.—Dry hills, 500 to 1500 ft.: Sierra Nevada foothills from Mariposa Co. to Shasta Co. June-Aug.

3. **L. dichótoma** Benth. Stem erect, 3 to 11 in. high, glabrous or nearly so, sparsely leafy, paniculately branched above (only obscurely dichotomous), the branchlets filiform and flexuous; leaves strigulose-pubescent; cauline leaves linear or linear-oblanceolate, entire, ½ to 2 in. long, sessile or nearly so, the basal ones oblong-oblanceolate, remotely serrate, 1 in. long, narrowed to petioles ½ as long; leaves of the branchlets short, hirsute-ciliate; involucral bracts broadish, not glandular or the glands sparse; rays 5, fan-shaped, 4 to 4½ lines long and nearly as wide; achenes obovate, much obcompressed, without nerve or keel on the ventral face.—Slopes of mts. bordering or near the Sacramento Valley, 1200 to 3000 ft.: Napa Range to w. Colusa and Glenn Cos.; Sierra Nevada foothills from Eldorado Co. to Butte Co. May-June.

98. **HOLOZÓNIA** Greene

Perennial herb with creeping rootstocks. Stems slender and branches almost filiform. Leaves opposite or the upper alternate. Heads solitary, on slender or filiform peduncles, without leafy bracts. Flowers white or rose-tinged; rays 5. Bracts of the involucre 5, completely enclosing and deciduous with the obcompressed ray-achenes. Bracts of the receptacle 9 to 12, connate into a cup surrounding the few to several disk-flowers. Ray-achenes

crowned with a small saucer-shaped cupule in place of pappus; disk-achenes with a pappus of 2 to 5 slender deciduous bristles. (Greek holos, whole, and zonia, zone, the bracts completely enclosing the ray-achenes.)

1. **H. fílipes** (H. & A.) Greene. Stem simple below, paniculately branched above, 1½ to 2¾ ft. high, very leafy; herbage villous-pubescent, especially the leaves; leaves linear, or the lower ones linear-lanceolate, entire or sparsely denticulate, sessile, 1 to 3 in. long, those of the filiform branchlets oblong to linear, 1 to 2 lines long, furnished with marginal short-stipitate glands; involucres loosely villous, their bracts little longer than the achene; bracts of receptacle chaffy, united half-way.—Dry hills, 300 to 1200 ft.: North Coast Ranges from Mt. Tamalpais to the Napa Range; Sierra Nevada foothills from Eldorado Co. to Mariposa Co. July-Aug.

99. ÁCHYRACHAÈNA Schauer

Soft-pubescent annual with narrow leaves, the lower opposite. Involucre oblong-campanulate, its bracts lanceolate, herbaceous, each enfolding a ray-achene. Bracts of the receptacle membranous, in a single outer series. Receptacle low-convex, naked. Flowers reddish brown. Ray-flowers 5 to 8, little exceeding the disk, their ligules short and broad, palmately 3-cleft. Achenes linear-clavate, all the ribs or the alternate ones scabrous. Disk-achenes with a pappus of about 10 silvery scales, the outer as long as the achene, the inner nearly twice as long. (Greek achuron, chaff, and Latin achaenium, an achene, on account of the very chaffy pappus borne on the fruit.)

973. Achyrachaena mollis Schauer; *a*, fl. stem x 1; *b*, fr. head x $\frac{2}{3}$; *c*, achene and pappus x $1\frac{7}{8}$.

1. **A. móllis** Schauer. BLOW-WIVES Fig. 973. Stem erect, simple or branching, 9 to 18 in. high, pilose-pubescent; branches more or less peduncle-like, each 1-headed; leaves linear, entire or serrulate, 5 in. long or less; heads in flower ¾ in. high, in fruit expanding and forming a globose cluster 1½ in. broad; achenes black; paleae of the achenes also expanding or diverging rotately.—Adobe soil, plains, valleys and low hills, 20 to 2600 ft.: throughout cismontane Cal.; n. to southern Ore. Apr.-May.

TRIBE 8. Ambrosieae. RAGWEED TRIBE

Coarse homely weeds or shrubs with small greenish or white heads. Leaves alternate or the lowest opposite in no. 102. Flowers unisexual, the staminate and the pistillate in separate heads (the staminate heads in a raceme or spike above the pistillate heads, which are few and axillary) or in the same head (heads solitary in the axils). Receptacle of the staminate or of the perfect heads with chaff-like bracts. Rays none. Corolla of pistillate flowers none or a mere rudiment. Anthers distinct or scarcely coherent, not caudate. Pappus none. Fruit commonly a bur.

100. ÌVA L.

Ours coarse perennial herbs. Leaves thickish, alternate (or the lower opposite), entire. Flowers greenish white, borne in small nodding spicate heads. Involucre hemispherical, its rounded bracts about 5. Receptacle with chaff-like linear or spatulate bracts. Marginal flowers of the head pistillate,

1 to 5 in number, their corollas tubular or none. Disk-flowers perfect, sterile, with 5-lobed funnelform corolla and undivided style. Anthers almost distinct. Achenes flattened, glabrous. Pappus none. (After Ajuga iva of the Mint Family, on account of the similar odor.)

Bracts of the involucre united into a lobed cup.....1. *I. axillaris.*
Bracts of the involucre distinct.....2. *I. hayesiana.*

1. **I. axillàris** Pursh. POVERTY WEED. Fig. 974. Stems many, erect from a decumbent or prostrate base, 6 to 10 in. high; leaves narrowly obovate, varying to lanceolate or linear, entire, sessile; heads solitary in the axils, short-peduncled, surpassed by the leaves; bracts of the involucre united into a lobed or merely toothed cup.—Alkaline plains and borders of salt marshes: throughout Cal.; n. to B. C., e. to Neb. Aug.-Sept. It is called Death Weed in Siskiyou Co., on account of persistently crowding out other plant life in cultivated fields. Var. PUBÉSCENS Gray. Herbage loosely villous; involucre turbinate, almost entire.—Near San Francisco Bay.

2. **I. hàyesiàna** Gray. Stems woody below, branched from the base, the ascending branches 2 to 3 ft. high; herbage strigose-puberulent; leaves spatulate-oblong to linear, very obtuse, entire, narrowed to the base, 1¼ to 2 in. long, the upper ones lanceolate and only slightly surpassing the heads; involucral bracts distinct.—Brackish or alkaline soil: w. San Diego Co.; s. to L. Cal.

974. Iva axillaris Pursh; *a*, fl. branchlet x ½; *b*, head x 2; *c*, pistillate fl. x 4; *d*, perfect fl. x 4.

101. **OXYTÈNIA** Nutt.

Shrubby erect perennial. Leaves alternate, 3 to 5-parted into filiform divisions, or the upper ones entire. Flowers unisexual, the heads borne in a panicle of spikes. Involucral bracts 5, rigidly acuminate at apex. Bracts of the receptacle slender, with dilated tips. Pistillate flowers about 5, destitute of corolla; staminate flowers 10 to 21. Achenes obovate, very villous with long soft hairs. Pappus none or a mere vestige. (Greek oxytenes, pointed, referring to the narrow rigid leaves.)

1. **O. aceròsa** Nutt. Stems half-woody, leafless and rush-like or sometimes densely leafy, 3 to 7 ft. high; leaves 1½ to 3 in. long; heads 2 lines high; involucral bracts roundish; bracts of receptacle incised at apex.—Alkaline plains, Death Valley region; e. to Ariz. and Utah.

102. **DICÒRIA** T. & G.

Annual herbs, white-hirsute with appressed hairs. Leaves alternate or the lower opposite. Flowers unisexual, greenish yellow. Heads small, nodding, borne in slender nearly leafless spikes, the spikes commonly paniculate. Involucre of 4 or 5 oblong or obovate short bracts. Heads of 2 kinds, androgynous and staminate. Staminate heads consisting of staminate flowers only. Androgynous heads consisting of staminate flowers and pistillate flowers: inner flowers 4 to 13, staminate only; corollas funnelform, 5-lobed; filaments united to form a slender tube, the tube funnelform at apex and 5-toothed, each tooth bearing an anther; anthers distinct or lightly coherent; ovary and style very rudimentary; subtending bracts slender or filiform; marginal flowers 2 (or 1), pistillate, without corolla and stamens, consisting

975. Dicoria canescens T. & G.; *a*, fl. branchlet x ½; *b*, staminate head x 2½; *c*, androgynous head x 2½; *d*, staminate fl. x 3½; *e*, pistillate fl. x 3½.

many flowered; receptacle of at least the outer flowers with slender bracts; corollas funnelform, 5-lobed. Pistillate heads in the axils of the upper leaves at the base of the staminate racemes:—involucres oblong or turbinate, closed, containing but a single flower; corolla none; pappus none; fruit an achene-like bur which is beaked or pointed and is armed near the top with a single row of prickles. (Ancient Greek name.)

Plants 2 to 6 ft. high; leaves pinnately incised . . . . . 1. *A. psilostachya.*
Plants ¾ to 1¼ ft. high; leaves 2 to 3 times pinnatifid into short crowded oblong lobes . . . . . 2. *A. pumila.*

1. **A. psilostàchya** DC. Western Ragweed. Fig. 976. Stem simple, erect, 1, 2 or more ft. high, from slender running rootstocks; herbage pubescent and somewhat strigose; leaves once or the lower twice pinnatifid; fruit an obovoid turgid bur, mostly solitary in the axils, bearing 4 protuberances or sometimes unarmed. — Uncultivated lands in the valleys, 10 to 1500 ft.: throughout cismontane Cal.; e. to Ill., n. to Can. Sept.-Oct.

of an ovary and deeply parted style, each subtended by a much enlarged thin-scarious roundish bract of the receptacle. Achene flattened or flattish, ridged on each side, margined with a deeply and coarsely pectinate border. Pappus of several very small scales. (Greek dis, twice, and koris, a bug, from the aspect of the two achenes.)

1. **D. canéscens** T. & G. Fig. 975. Bushy branching, 1 to 2½ ft. high, or sometimes simple dwarfs only 4 in. high; leaves oblong-lanceolate to ovate, ½ to 1¼ in. long, on short petioles, the lower opposite, the upper alternate; heads 3 to 4 lines high, scarious bracts of the receptacle, subtending achenes, 3 to 4 lines long, 2 to 3 times as long as the involucre; central bract of the staminate cluster often elongated and greenish at tip.—Sandy washes or alkaline flats: Colorado and Mohave deserts; Inyo Co.; e. to Utah.

103. **AMBRÒSIA** L. Ragweed

Ours coarse homely but aromatic perennial herbs with alternate pinnatifid leaves. Flowers inconspicuous, greenish, unisexual. Staminate heads disposed in erect catkin-like racemes: — involucres broadly hemispherical,

976. Ambrosia psilostachya DC.; *a*, infl. x ½; *b*, stam. head x 3; *c*, bract x 3; *d*, stam. fl. x 6; *e*, pist. fl. x 3.

2. **A. pùmila** Gray. Stems branching from the base, erect, 5 to 9 (or 15) in. high from slender running rootstocks; herbage whitish-pubescent with soft white hairs; leaves 1 to 5 in. long, 2 to 3 times pinnatifid into short lobes, also with similar reduced pinnae or lobes extending more or less down the petiole; lobes of the leaves oblong, crowded, 1 to 3 lines long; fruit obovoid, muticous, pubescent, 1 line long.—Vicinity of San Diego.

104. FRANSÈRIA Cav.

Perennial (or annual) herbs, or bushes. Leaves chiefly alternate. Flowers inconspicuous, greenish, unisexual, the staminate and pistillate in separate discoid heads. Staminate heads nodding in catkin-like spikes or racemes, the pistillate heads in the axils of the upper leaves at the base of the staminate inflorescence or rarely scattered throughout. Involucre of the staminate heads bowl-shaped or turbinate; corolla funnelform, 5-lobed. Involucre of the pistillate heads closed, 1 to 4-celled, 1 to 4-beaked or pointed, armed with several rows of spines and in fruit becoming a bur; corolla none or rudimentary. Bur hairy or glabrous but always more or less minutely glandular. (Ant. Franser, Spanish botanist.)

Herbs; leaves pinnatifid or pinnately parted, or merely toothed in no. 4.
  Bur 1 to 1½ lines long, its spines mostly hooked at tip.....1. *F. tenuifolia.*
  Bur 3 to 4 lines long, its spines not hooked.
    Burs glabrous; staminate heads 1 to 2 lines broad; spines thin; inland species...
      2. *F. acanthicarpa.*
    Burs more or less hairy; staminate heads 2½ to 3½ lines broad; spines thick; seashore species.
      Leaves twice or thrice pinnatifid or pinnately parted....3. *F. bipinnatifida.*
      Leaves merely serrate or some (usually the lower) incised.4. *F. chamissonis.*
Low shrubs, or at least woody at base.
  Leaves petioled, the blades not spinose.
    Bur with straight spines.
      Leaves pinnately parted; spines of bur glabrous or minutely pubescent.....
        5. *F. dumosa.*
      Leaves pinnatifid or with salient lanceolate teeth; spines of bur conspicuously and densely white-villous.....6. *F. eriocentra.*
    Bur with uncinate spines woolly at base; leaves ovate, crenate or nearly entire...
      7. *F. chenopodiifolia.*
  Leaves sessile, the blades spinosely dentate.....8. *F. ilicifolia.*

1. **F. tenuifòlia** Gray. Erect perennial herb 1 to 2 ft. high; herbage hispidulose; leaves bipinnately parted or dissected into narrowly oblong or linear lobes, the primary rachis with interposed small lobes, the terminal lobes, elongated; staminate heads borne in a panicle of spikes; pistillate involucres glomerate below, obovate with narrow base, 1¼ lines long, usually 2-flowered; bur about 1¼ lines long, minutely glandular-pubescent, its spines stout, incurved and commonly hooked, a pit with a cartilaginous border above each.—Commonly dry plains, coastal S. Cal.; e. to Col., s. to Mex.

2. **F. acánthicàrpa** (Hook.) Cov. Annual; stems diffusely branching or sometimes rather strict, 1 to 2 ft. high; herbage scaberulose, sometimes canescent; leaves broadly ovate in outline, once or twice pinnatifid into rather broad and short often toothed lobes, 1¼ to 3½ in. long, on petioles nearly as long; staminate racemes in panicles, pistillate involucres in the axils below, solitary or 2 or 3 together, 1-flowered, glabrous but minutely glandular; spines flat, thin, lanceolate-subulate, the tips straight or slightly curved but not uncinate.—Sandy plains and summer beds of winter flood streams from Monterey Co. to San Diego Co., thence n. through the Mohave Desert to Mono Co.; n. to Wash., e. to Col.

3. **F. bipínnatífida** Nutt. Perennial herb; stems procumbent, herbaceous, 2 or 3 ft. long, somewhat hirsute; leaves twice or thrice pinnately parted into oblong lobes, canescent or almost silky; spikes dense; bur narrowly ovate, its spines somewhat flattened or semiterete, some of them curved at the tip.—Common on sandy seabeaches along the coast from San Diego Co. to Del Norte Co.; n. to B. C., s. to L. Cal. Aug.-Oct.

4. **F. chamissònis** Less. Fig. 977. Habit of no. 3; leaves narrowly ovate to oblong, sometimes broadly ovate or obovate, cuneate at base, serrate, or the lower laciniate or incised, silky, ½ to 1½ in. long; bur thicker, sparsely hirsute and minutely and often obscurely glandular, the spines distinctly

977. Franseria chamissonis Less.; *a*, fl. branchlet x ½; *b*, staminate head x 2; *c*, staminate fl. x 3; *d*, fr. head x 2.

broader and channeled or somewhat trough-like above.—Seabeaches along the coast, less common than no. 3: Santa Cruz Co. to Humboldt Co.; n. to B. C.

5. **F. dumòsa** Gray. BURRO-WEED. Low rounded bush 10 to 20 in. high, with rigid brittle branches, the slender branchlets terminating in a spicate inflorescence and becoming in the second year naked, indurated and spine-like; stems whitened and the foliage grayish with a fine close pubescence; leaves small (6 to 8 lines long, rarely to 1¾ in. long), once, twice or thrice pinnately parted into a few very short very obtuse lobes; fertile involucres globular, mostly 2-flowered, glabrous or pubescent, their spines long, sparingly villous, tapering from a broad flat base to a straight tip.—Exceedingly abundant on the Colorado and Mohave deserts; e. to Utah, s. to Mex. It is commonly associated with Larrea. Also called Sand-bur.

6. **F. èriocéntra** Gray. Spreading bush 1 to 3 ft. high, with numerous slender but rigid white-barked branches; herbage whitened with a minute tomentum, the leaves soon glabrate and green above; leaves cuneate-oblong to lanceolate, saliently few-toothed or lobed to sparingly and irregularly sinuate-pinnatifid, nearly sessile by an attenuate base, 1 to 1½ (or 2) in. long; staminate involucre bowl-shaped, 2 to 2½ lines high, deeply lobed, its lobes very acute; pistillate involucre one-flowered, the body and its straight rigid subulate spines villous, the long white hairs tufted at the ends of the spines; beak single, subulate, as long as the body.—Sandy deserts, e. Mohave Desert (New York Mts.); e. to southern Nev. and northern Ariz.

7. **F. chenopòdiifòlia** Benth. Low (8 to 12 in. high), much branched, woody only at base; leaves broadly ovate, crenate, obtuse, cuneate to subtruncate at base, white-tomentulose below, glabrate and greenish above, 1 to 1¼ in. long, the petioles 3 to 6 lines long; pistillate involucre globose, 2 or 3-flowered, woolly between the spines; spines lanceolate-subulate, hooked at the tip.—Sw. San Diego Co.; s. to L. Cal.

8. **F. ilicifòlia** Gray. Much-branched shrub about 3 ft. high, the branches hirsute or hispid, very leafy up to the inflorescence; leaves oblong or ovate, rigidly coriaceous, scabrous, reticulate-veiny below, coarsely and very unequally spinose-dentate, 1 to 3½ in. long, sessile by a clasping auriculate base; involucres shortly peduncled; staminate involucres with lanceolate acerose lobes; pistillate involucres ovoid, glandular-pubescent, 6 to 7 lines broad including the very numerous slender uncinate prickles; beak stout, 2-toothed.—Desert mts., Colorado Desert: Santa Maria Mts.; Signal Mt.; s. to L. Cal.

105. HYMÈNOCLÈA T. & G.

Shrubs with slender diffuse branches. Leaves alternate, filiform, entire or the lower parted into filiform lobes. Heads numerous, small, unisexual, the staminate and pistillate intermixed in profuse panicles or the latter in the lower axils. Staminate heads several-flowered; involucre bowl-shaped, 4 to 6-lobed; corolla scarious, 4 or 5-lobed; bracts of the receptacle obovate or spatulate, or the innermost filiform, or none. Pistillate flowers solitary in

ovoid or fusiform involucres; involucres beaked at tip and winged on the sides with broad silvery-scarious scales; corolla none. (Greek, humen, membrane, and kleio, to enclose.)

Pistillate involucre covered with spirally disposed scales.....1. *H. salsola.*
Pistillate involucre with only a single whorl of scales at the middle.....
2. *H. monogyra.*

1. **H. sálsola** T. & G. Fig. 978. Spreading bush 1½ to 3 ft. high; leaves sparse, ⅛ or mostly ¾ to 1½ in. long, the canescent band beneath soon concealed by the revolute margins; bracts of the staminate involucre lightly ciliate-erose; scales of the pistillate involucre spirally arranged from the base to near the middle, orbicular-reniform, that is, broader than long, 1½ to 2½ lines long, the margins commonly erose, often with an apical mucro; panicles often very heavy with the shining fruit, weighting down the branches. —Common in sandy washes and stream beds and in alkaline soil, mostly in the deserts: Colorado and Mohave deserts to Inyo Co., extreme southern Sierra Nevada, upper San Joaquin Valley and adjacent inner South Coast Range; e. to Nev. and Ariz., s. to L. Cal.

978. Hymenoclea salsola T. & G.; *a*, fl. branchlet x ⅓; *b*, staminate head x 3; *c*, staminate fl. x 3; *d*, pistillate fl. x 1½.

2. **H. monogỳra** T. & G. Branches commonly more strict and more leafy than in no. 1; scales of the pistillate involucre 7 to 9, in a single whorl around the middle of the involucre, obovate, that is, longer than broad, ½ to 1 line wide, the margin erose or with one apical tooth most prominent.—Desert washes: San Diego; e. to Tex., s. to L. Cal.

106. XÁNTHIUM L.

Coarse (by some called vile) annual weeds with widely branching and very stout stems. Leaves alternate, toothed or lobed, petioled. Heads unisexual, composed of greenish flowers. Staminate heads subglobose, in a terminal cluster:—involucre of several distinct narrow bracts in a single row; receptacle cylindrical; flowers many, separated by the bracts of the receptacle; corolla tubular. Pistillate heads axillary, situated below the staminate:—involucre closed, 2-celled (each cell containing one flower), forming in fruit an ovoid or oblong indurated bur covered all over with hooked prickles and 1 or 2-beaked; corolla none; pappus none; style 2-cleft, its branches exserted through the beaks. (Greek xanthion, yellow, from its yielding a hair-dye of that color.)

Leaves lanceolate; stems bearing spines by the sides of the leaves.....1. *X. spinosum.*
Leaves deltoid-ovate; stems not spiny.
Burs oblong or elliptic in outline, ½ to 1 in. long.
Spines not crowded (the body of the bur visible between them); body and the lower part of spines covered with short glandular hairs.2. *X. canadense.*
Spines densely packed (concealing the body), nearly free from glands and hairs.
3. *X. calvum.*
Burs ovoid, 1 to 1¼ in. long; spines (on lower part) and body densely covered with whitish glandular hairs.....4. *X. campestre.*

1. **X. spinòsum** L. Spiny Clotbur. Fig. 979. Stems puberulent, much branched; leaves lanceolate or ovate-lanceolate, acute or acuminate, 2 or 3-lobed or -cut, or the upper entire, narrowed at base into a short petiole, green above, white-pubescent beneath, 2 to 5 in. long; by the sides of the

979. Xanthium spinosum L.; *a*, fl. branchlet x ½; *b*, bract of stam. head x 4; *c*, stam. fl. x 4.

leaves are borne yellowish 3-pronged spines 1 in. long; corolla pubescent with short rusty hairs; bur narrowly oblong, ½ in. long, sparsely prickly; beaks inconspicuous, only one spinose. —Naturalized European weed, everywhere a common summer tenant of barnyards and neglected fields. It is also called Spanish Thistle.

2. **X. canadénse** Mill. COCKLE BUR. Fig. 980. Stems about 2 ft. high, not prickly; leaves deltoid-ovate or somewhat cordate, irregularly serrate, or somewhat incised, often distinctly 3-lobed, rough, hispidulous and green both sides, 3 to 4 in. long, on petioles nearly as long; bur ½ to 1 in. long, thick, glandular-pubescent on the body and on the lower part of the crowded spines and bearing at apex a pair of strong beaks hooked or incurved at tip; spines about 1¼ to 2 lines long.—Naturalized weed, native of the e. U. S., exceedingly abundant in low or marshy lands, often covering hundreds of thousands of acres. Flowering in summer and fruiting in autumn. Var. PALÙSTRE Jepson n. comb. Spines sparser and shorter (about 1 line long). —Suisun Marshes. (Xanthium palustre Greene.)

3. **X. cálvum** M. & S. Burs 5 to 6 lines long, the body narrowly oblong, densely packed with spines, rarely sparsely spinose; spines glabrous or nearly so.—Low ground, San Francisco Bay region.

4. **X. campéstre** Greene. Burs ovoid in outline, 1 to 1¼ in. long, 10 to 11 lines in diameter; spines 1¾ to 2 lines long, rather densely clothed with whitish glandular hairs in the lower part.—Butte Co. plains.

TRIBE 9. **Heleníeae.** SNEEZEWEED TRIBE

Herbs or some Eriophyllums suffruticose. Leaves alternate or opposite. Flowers commonly yellow. Rays present or none in some species. Anthers not caudate. Receptacle commonly naked. Bracts of the involucre in 1 or 2, sometimes in 3 or 4 series. Pappus of paleae, awns or bristles, or often wanting.

107. **PERÍCOME** Gray

Perennial herb, with long-acuminate alternate leaves and yellow flowers. Heads small, corymbosely clustered in a loose panicle. Rays none. Bracts of the involucre numerous, narrow, in a single series and

980. Xanthium canadense Mill.; *a*, fl. branchlet x ⅓; *b*, stam. head x 2; *c*, bract of stam. head x 4; *d*, stam. fl. x 4; *e*, stamen-column x 4.

very lightly united by their edges into a cup. Achenes flattened, the fertile ones black and with a cord-like border, all strongly hirsute-ciliate around the margin. Pappus a crown of lacerate scales. (Greek peri, around, and come, a tuft of hairs around the margin of the achene.)

1. **P. caudàta** Gray. Stems slender, tall, widely branching, 4 to 5 ft. high, forming thick clusters, glabrous; leaves opposite, sometimes alternate, triangular, lanceolate, attenuate, saliently dentate just above the truncate base, green, membranous, microscopically and remotely hispidulose, 1¼ to 2½ in. long; heads 5 lines high; involucral bracts narrowly linear, densely tomentulose at tip inside; achenes 3 to 3½ lines long; pappus of 2 or 3 broad lacerate hyaline paleae, "also sometimes a slender awn from one or both margins of the achene."—Moist rocky slopes, 4000 to 6500 ft.: east slopes of the s. Sierra Nevada in Tulare Co.; Inyo Co.; e. to Col. and N. Mex.

108. **LASTHÈNIA** Cass.

Glabrous slightly succulent annuals. Leaves opposite, entire, sessile and more or less connate at base. Heads on slender peduncles. Flowers yellow; rays 5 to 15. Bracts of the involucre more or less united into a hemispherical or campanulate toothed cup. Receptacle conical or subulate, covered with projecting points which bear the linear or linear-oblong flattened achenes. Pappus of 5 to 10 paleae or none. (Named for a Greek girl who attended the lectures of Plato in the garb of a man.)

Pappus none; rays conspicuous.....1. *L. glabrata.*
Pappus of 5 to 10 paleae, 2 or 3 awn-pointed; rays very inconspicuous...2. *L. glaberrima.*

1. **L. glabràta** Lindl. Stem usually branching at or above the base, 11 to 17 in. high; leaves linear and entire or sometimes the upper pair broadly lanceolate and toothed, conspicuously connate and sheath-like at base, 1 to 1¾ in. long; peduncles long, erect; involucres broadly hemispherical; rays 3 to 5 lines long.—Borders of salt marshes: Coast Ranges; Great Valley. Var. CALIFÓRNICA Jepson. Leaves less or scarcely at all connate; peduncles corymbose.—Plains and low hills, Sierra Nevada foothills. May. Var. CÒULTERI Gray. Achenes smaller and narrower, with obtuse edges, sprinkled with minute rough or callous points.—Saline marshes: upper San Joaquin Valley; coastal S. Cal.

2. **L. glabérrima** DC. Stem ascending, simple or sparingly branched, 5 to 15 in. long; leaves linear, entire, 1 to 3 in. long; heads on short peduncles, nodding after anthesis and before maturity, about 3 lines broad, seemingly rayless, the rays very small (½ to ¾ line) and inconspicuous; involucres with about 15 short teeth; corollas all shorter than their achenes; achenes with scattered short stiff hairs; pappus of 5 to 10 rigid paleae, erose or laciniate at apex or some of them subulate-pointed or short-awned.—Half-aquatic in winter pools or in wet fields, 10 to 5000 ft.: Coast Ranges from Humboldt Co. to Alameda Co.; Great Valley; n. to Ore. May-June.

109. **BAÈRIA** F. & M. GOLD FIELDS

Low and mostly slender annuals (except no. 1). Herbage commonly pubescent but never hoary. Leaves opposite, linear to oblong, entire or laciniate-pinnatifid. Flowers yellow, the heads on slender peduncles. Rays 5 to 15, showy for the size of the heads, or sometimes fewer and very short. Involucre campanulate or hemispherical, rarely cylindric, its bracts as many as the rays, ovate or oblong and becoming more or less carinate below the middle. Receptacle subulate-conical, or dome-shaped in no. 7. Achenes linear but somewhat broadened upward. Pappus of paleae or awns or both or none. (The Russian zoologist, Baer.)

Perennial, with horizontal rootstock.....1. *B. macrantha.*
Annuals.
Heads hemispherical to broadly campanulate.
Lower leaves (and usually all) entire or sometimes hispidly ciliate towards the base, not laciniate-pinnatifid (except sometimes in no. 3); pappus of 1 kind (awns or paleae tapering into awns) or pappus lacking.
Rays exceeding the disk-flowers (except in depauperate forms of no. 4); bracts mostly more than 6.
Leaves fleshy, obtuse, 1 to 4 lines broad.....2. *B. hirsutula.*

Leaves thin, acute, ¼ to 1 (or 1½) lines broad.
Pappus of 4 or 5 ovate paleae tapering into slender awns or pappus lacking; plants mostly glabrous; bracts strongly keeled... 3. *B. platycarpha.*
Pappus of 2 to 4 awns slightly broadened at base or pappus none; plants pubescent; bracts not strongly keeled..... 4. *B. chrysostoma.*
Rays not or rarely exceeding the disk-flowers; bracts 5 or 6; stems weak... 5. *B. debilis.*
Lower leaves (and sometimes the upper) laciniate-pinnatifid; pappus of 2 kinds (awns and paleae) or pappus lacking.
Herbage somewhat glandular; receptacle foveolate, conical; leaves all laciniate; plants 4 to 12 in. high.....6. *B. aristata.*
Herbage not glandular; receptacle strongly muricate.
Stems erect or at length spreading; rays elliptic or oblong, longer than the disk-flowers; plants 2½ to 10 in. high.
Receptacle with broad base and rounded top, hairy; stems erect... 7. *B. fremontii.*
Receptacle conical, not hairy; stems erect or spreading..... 8. *B. uliginosa.*
Stems weak, decumbent, succulent; rays oval, scarcely equaling the disk-flowers; insular and coast species.....9. *B. maritima.*
Heads cylindric; rays so inconspicuous as to seem lacking; bracts 3 or 4, oblong..... 10. *B. microglossa.*

1. **B. macrántha** Gray. Stems simple or nearly so, 8 to 24 in. high, arising from tuberous horizontal roots; leaves linear, entire, 1 to 4 (or 10) in. long, 1 to 3½ lines wide, obtuse, hispidly ciliate and saliently toothed towards the base; heads 9 to 12 lines broad, on peduncles 4 to 12 in. long; bracts about 12, hirsute-pubescent, ovate; rays 5 to 8 lines long; pappus of 1 to 4 brown bristles slightly thickened at base, or pappus none; achenes hispidulose.—Along the coast from Marin Co. to Mendocino Co. Var. LITTORÀLIS Jepson n. name. Stout, 4 to 7 in. high, hispid; leaves ½ to 1 in. long, 3 to 5½ lines broad; heads 1 to 1½ in. broad; pappus none; achenes glabrous or papillate.—Seacoast: Dillons Beach, Marin Co. (Burrielia chrysostoma var. macrantha Gray.) Var. PAUCIARISTÀTA Gray. Six in. high; rays 4 to 5 lines long; pappus of 1 to 3 subulate awns, little shorter than achene.—Mendocino coast.

2. **B. hirsùtula** Greene. Fig. 981. Stem branching at base and diffusely spreading or erect and branching above, 2 to 7 in. high; herbage hirsute-pubescent; leaves rather succulent, linear to oblong or sometimes spatulate, obtuse, often with saliently projecting teeth, 1 to 3 in. long, 1 to 3 (or 4) lines wide, hirsute; heads 8 to 14 lines broad; bracts about 12, obovoid, acutish, hirsute; rays oblong; pappus of 2 to 5 brownish awn-like bristles slightly thickened at base and as long or longer than achene, or pappus none; achenes hirsutulose, or glabrous when pappus is lacking.—Hillsides near the coast: San Luis Obispo; San Mateo Co.; San Francisco; Pt. Reyes. (Lasthenia hirsutula Greene). The slender forms seem to grade into B. chrysostoma var. gracilis Hall.

981. Baeria hirsutula Greene; *a*, habit x ½; *b*, disk-fl. x 4.

3. **B. platycárpha** Gray. Stems wiry and purplish, several from the base and erect or diffusely branched, 4 to 10 in. high; herbage essentially glabrous, sometimes scantily villous; leaves entire or laciniately cleft, linear, 3 to 8 (or 10) lines long; heads 4 to 9 lines wide; bracts 6 or 7, oblong, 3-nerved at base, the midnerve carinately thickened; pappus-paleae 4 to 7, broadly ovate, bright white, lanceolate-attenuate into an

awn, the whole as long or slightly longer than the achene, or pappus none.—Salt marsh and alkaline plains: Sacramento Valley; Sonoma Co.; San Joaquin Valley; S. Cal. The smaller forms from S. Cal. grade into B. chrysostoma var. gracilis Hall. (Burrielia platycarpha Gray. Baeria carnosa Greene.)

4. **B. chrysóstoma** F. & M. GOLD FIELDS. Stems slender, mostly erect, simple or freely branching, 5 to 9 in. high (or 1½ to 3 in. high in depauperate forms); herbage villous-pubescent to hirsutulous; leaves linear, entire, 3 to 18 lines long, ¼ to 1 line wide; heads 2½ to 4 lines high; rays and bracts of the broad involucre 7 to 15, or in depauperate plants fewer; rays 3 to 4 lines long; achenes linear-clavate, smooth (seldom pubescent) and shining, or papillate; pappus typically none.—Lower foothills, valleys and plains, 100 to 2500 ft.: throughout cismontane Cal.; n. to southern Ore. It is everywhere abundant, often coloring leagues and leagues of interior hills. Var. GRÁCILIS Hall. Habit of the species; pappus of 1 to 4 awns from small ovate or lanceolate paleae.—Open hills, 500 to 4000 ft.: Humboldt Co. and Nevada Co. to coastal S. Cal. (B. gracilis Gray. Burrielia gracilis DC.)

5. **B. débilis** Greene. Stems few or several from the base, ascending, 2 to 10 in. long; herbage thinly pilose; leaves linear, entire or saliently few-lobed, ¾ to 2½ in. long; involucres 2 to 3 lines high; rays hardly over 1 line long; anther-tips ovate-lanceolate; pappus of 3 or 4 firm ovate-lanceolate and awned paleae, or in some heads none, then the achene with narrower apex.—Upper San Joaquin Valley from Fresno Co. to Kern Co. and the bordering Sierra Nevada foothills. Apr.

6. **B. aristàta** (Nutt.) Cov. Stems slender, simple or freely branching, 4 to 12 in. high; herbage minutely glandular-pubescent; leaves laciniately pinnatifid into linear divisions; heads 3 to 7 lines broad; rays about 12 (or 6 to 8 in smaller forms), 2 to 4 lines long; pappus of (6 or) 8 to 12 lanceolate paleae, mostly tapering into awns, or pappus lacking.—San Diego to San Bernardino and Los Angeles Cos. Mar.-Apr. (B. affinis Gray. Ptilomeris aristata Nutt.)

7. **B. fremóntii** (Torr.) Gray. Stems erect, slender, one or several from the base, 5 to 10 in. high; herbage nearly glabrous below, rather finely pubescent on the peduncles and involucres, or the involucres subcanescent; leaves 6 to 12 lines long, narrowly linear and entire or more commonly pinnately parted into linear lobes; involucres broad, their bracts 10 to 12, broadly ovate; receptacle broad, hairy; ray-flowers as many or fewer, with oval rays shorter than the width of the disk; pappus of about 4 slender awns and as many or more numerous very small paleae, or pappus seldom none.—Plains: Sacramento Valley; San Joaquin Co.; Contra Costa Co. Mar.-Apr. (Dichaeta fremontii Torr.)

8. **B. uliginosa** (Nutt.) Gray. Stems stout and somewhat succulent, lax and at length diffusely branched, 2½ to 5 in. long; herbage villous-tomentose (when young) to glabrate; leaves linear-lanceolate, ½ to 1½ in. long, laciniate-pinnatifid into few broad lobes, or the upper entire; bracts and rays 10 to 13; awns 2 to 4 (commonly 3 or 4), with short intervening paleae, or pappus none.—

982. Baeria uliginosa var. tenella Gray; *a*, fl. branchlet x 1; *b*, lower leaf x 1; *c*, disk-flower x 4.

Low grounds, San Francisco to Santa Barbara. Apr.-June. (Dichaeta uliginosa Nutt.) Often similar in appearance to no. 9. Passes into var. TENÉLLA Gray. Fig. 982. Stems few, simple, commonly erect, 5 to 12 in. high, or lower and branched; awns 2, sometimes 1.—Tulare, Contra Costa and Mariposa Cos. (B. tenella Greene. Dichaeta tenella Nutt.)

9. **B. marítima** Gray. Stems stout, sometimes 3 lines broad, succulent, spreading and diffusely branching, 3½ to 10 (or 24) in. long; herbage villous to glabrate; leaves oblong-linear to oblong, sparingly broadly toothed or entire, ¾ to 1¼ (or 3) in. long, 2 to 4 (or 9) lines wide; rays 6 or 8, short and broad; pappus of 3 to 5 slender awns, with intervening laciniate paleae; achenes appressed-pubescent.—Coastal from Monterey Co. to Humboldt Co.; n. to Vancouver Isl.

10. **B. microglóssa** Greene. Stem very slender, 2 to 6 in. high; leaves linear, entire, 3 to 12 lines long, ½ to ¾ line wide; heads about 7 to 9-flowered; involucres very narrowly cylindrical; rays very short (¼ line long) and inconspicuous, thus apparently rayless; bracts of the involucre 3 or 4, narrowly oblong; achenes narrowly linear-clavate, thinly hirsutulose; pappus-paleae 2 to 4, subulate below, attenuate into a bristle.—Valley floors and low hills: foothills on w. side Sacramento Valley; South Coast Ranges; coastal S. Cal. (Burrielia microglossa Gray.)

110. **MONOLÒPIA** DC.

White-woolly annuals. Leaves alternate, sessile, entire, low-denticulate or lobed. Heads large, pedunceled. Flowers golden yellow. Involucre hemispherical, its bracts united into a cup with broad or triangular teeth, or distinct to the base. Receptacle conical. Rays broad, 2 to 4-toothed, bearing at base and opposite the ligule an oblong or roundish denticulate appendage. Achenes angular, black. Pappus none. (Greek mono, single, and lopos, husk, on account of the bracts of the involucre.)

983. Monolopia major DC.; *a*, fl. branchlet x ½; *b*, head x 1; *c*, disk-fl. x 3.

Rays 3 or 4-toothed at apex and bearing at base on the opposite side of the style a roundish denticulate appendage; heads on erect peduncles; leaves entire or nearly so, sessile or partly clasping by a broadish base; back of corolla-lobes with a fringe of bristles or of very short hairs; corolla-tube and lower part of throat with scattered short gland-tipped hairs outside.

Bracts united into a toothed cup. . . . . 1. *M. major.*

Bracts distinct to the base. . 2. *M. gracilens.*

Rays barely 2 or 3-toothed at apex, destitute of basal appendage; heads, at least in age, on more or less curved peduncles; leaves pinnately lobed (or the upper entire), narrowed at base; involucral bracts separate to the middle; back of corolla-lobes glabrous; lower part of corolla-throat shaggy-villous outside. . . . . 3. *M. bahiaefolia.*

1. **M. màjor** DC. Fig. 983. Stem stoutish, simple or branching, 8 to 20 in. high; tomentum floccose and tardily deciduous; leaves mostly oblong-lanceolate, low-denticulate or commonly entire, ½ to 4 in. long; bracts of the involucre united into a broadly campanulate cup (6 to 7 lines broad) with triangular teeth; rays 8 (or 9), 3 or 6 to 10 lines long.—Grassy hills or valleys in adobe soils, 25 to 1500 ft.: Great Valley and South Coast Ranges to San Diego Co. May.

2. **M. grácilens** Gray. Stem slender, paniculately branched above or from near the base, ½ to 2 ft. high; leaves narrowly oblong to linear-lanceolate, low-denticulate or entire, 1½ to 3½ in. long; involucre 3 to 6 lines broad, its bracts distinct to the base; rays 2 to 6 lines long; achenes ¾ to 1 line long.—Hill slopes, 100 to 1500 ft.: Santa Cruz Mts. to Santa Barbara Co.; e. to inner South Coast Range in Fresno Co. June.

3. **M. bahíaefòlia** Benth. Stem simple, erect or ascending, 2 to 4½ in. high, terminated by a solitary peduncled head, or rarely branched above and bearing 2 or 3 heads; herbage white-tomentose, becoming floccelent; leaves spatulate to oblanceolate or linear, entire, toothed, pinnately cleft or parted, 3 to 9 lines long, 2 to 3 lines broad; bracts of the involucre distinct to about the middle.—Hill slopes, Sierra Nevada foothills and bordering plains: Yuba Co.; Auburn; Snelling.

111. **ÈRIOPHÝLLUM** Lag.

Annual or perennial herbs or woody-based plants. Herbage white-woolly, the tomentum often deciduous or floccose. Leaves alternate, divided or incised, or sometimes entire. Involucre oblong to hemispherical, its bracts distinctly rigid and permanently erect. Receptacle flat or convex, naked (except in no. 8). Rays 4 to 13 or 15, broad (sometimes wanting). Tube of disk-corolla commonly glandular and hairy. Achenes linear or cuneate-linear. Pappus of firm paleae or none. (Greek erion, wool, and phullon, leaf, the herbage woolly.)

A. Heads 2 to 8 lines broad, in rather dense terminal clusters or corymbs, sessile or on peduncles ½ to 6 lines long.

Perennials (or biennials), somewhat woody at base, ¾ to 3½ ft. tall, erect or at base decumbent; heads peduncled.
- Leaves pinnately divided, clothed on both sides with persistent white tomentum, the lower 3 to 5 (or 7) in. long; cymes broad, heavily clustered; insular species. ..... 1. *E. nevinii.*
- Leaves entire to pinnately parted, usually glabrous or glabrate on the upper surface, ½ to 2 in. long; cymes fewer-flowered; rays 1 to 2 lines long; mainland species.
  - Stems (1½ or) 2 to 3½ ft. high; involucres 2½ to 3 lines high; rays 6 to 8.... 2. *E. staechadifolium.*
  - Stems ¾ to 2 ft. high; involucres 1½ to 2 lines high..... 3. *E. confertiflorum.*

Annuals, low (½ to 5 in. high) and spreading; leaves lobed at the apex; receptacle flat or nearly so; heads sessile or nearly so.
- Rays present ..... 4. *E. multicaule.*
- Rays none; caespitose plants.
  - Involucral bracts about 8; pappus-paleae 4 or 5..... 5. *E. pringlei.*
  - Involucral bracts 3; pappus-paleae 11 to 13..... 6. *E. mohavense.*

B. Heads not clustered, solitary or loosely corymbose, their peduncles ½ (sometimes less in no. 7) to about 8 in. long.

Annuals; heads 5 to 15 lines broad.
- Leaves entire to merely toothed.
  - Pappus-paleae equal in length or subequal, or wanting; peduncles not swollen toward the summit.
    - Stems compact, densely woolly; peduncles 3 to 9 lines long; anther-tips linear-subulate ..... 7. *E. wallacei.*
    - Stems erect or spreading, less woolly; peduncles ¾ to 4 in. long; anther-tips obtuse or acute..... 8. *E. ambiguum.*
  - Pappus-paleae very unequal in length; stems rigid, ascending; peduncles swollen towards the summit ..... 9. *E. congdonii.*
- Leaves mostly pinnately parted; pappus none..... 10. *E. heermannii.*

Perennials (or biennials); heads ½ to 1½ in. broad, long-peduncled.
- Heads mostly loosely corymbose..... 11. *E. jepsonii.*
- Heads mostly solitary.
  - Montane or inland species; leaves entire, toothed or pinnately parted or cleft into narrow lobes, the lobes mostly ¼ to 1 line wide; herbage white-woolly, sometimes more or less glabrate, the upper surface of the leaves often green; vars. of..... 12. *E. lanatum.*
  - Sea bluffs and beaches; herbage white-tomentose, the upper surface of the leaves green and glabrate ..... 13. *E. caespitosum.*

1. **E. nevínii** Gray. Stems ascending, 1 to 3 ft. high, woody below; leaves white-tomentose, mostly basal or on lower part of stem, the stems glabrate; leaves ovate in outline, 3 to 5 (or 7) in. long, once or twice pinnately parted into numerous lobes, the lobes oblong, obtuse, 3 to 9 lines long; heads numerous, 3 to 4 lines high, densely crowded in broad flattish compound cymes, their peduncles naked or nearly so; bracts oblong, obtuse, rather

984. Eriophyllum confertiflorum Gray; *a*, habit x ½; *b*, disk-fl. x 3; *c*, ray-fl. x 3.

loose; rays 7 to 10, yellow, little longer than the bracts; pappus of 4 to 6 erose paleae, often unequal, the longer ones lanceolate and acute.—Santa Barbara Isls. May-Aug.

2. **E. stáechadifòlium** Lag. LIZARD TAIL. Diffuse bush, 1½ to 3 ft. high; leaves 1 to 1¾ in. long, linear, narrowed toward the base, entire, or rarely with 1 or few teeth, the margins revolute and the under surface white with a dense felt-like tomentum; upper surface of leaves green and the tomentum of the stems eventually deciduous; heads disposed in close compact corymbs; involucres broadly oblong or somewhat turbinate, 2½ to 3 lines high, their bracts linear; rays 6 to 8, 1 to 2 lines long; pappus-paleae 7 to 9, unequal. — Seabeaches: Monterey; Santa Cruz. Var. ARTEMISIAEFÒLIUM (Less.) Mcbr. Leaves ovate to roundish-ovate in outline, ½ to 1¾ in. long, pinnately parted into 5 to 7 lobes, the lobes a little remote and entire or again pinnately parted or toothed; petioles broad or ligulate, 2 to 7 lines long.—Rocky bluffs and beaches along the seacoast, 10 to 100 ft.: Del Norte Co. and Cape Mendocino to Santa Barbara; Santa Barbara Isls. May. (Bahia artemisiaefolia Less.)

3. **E. confértiflòrum** Gray. Fig. 984. Plants ¾ to 2 ft. high, the stems several to many from the root-crown, soon parted into erect or ascending mostly simple branches, the branches very leafy below, ending above in a compact or even head-like cyme; herbage closely tomentose, the tomentum at length deciduous; leaves 2 to 4 (or 12) lines long, ternately or pinnately parted into 3 to 7 narrowly linear divisions; petioles broad, ½ to as long; heads many in compact terminal clusters; involucres obovoid-oblong, 1½ to 2 lines high, the bracts about 5, ovate; rays 4 or 5, sometimes wanting, 1½ to 2 lines long; paleae 8 (or 9), nearly equal, about ½ as long as the achene.—Ridges and dry slopes in the hills and mts., 25 to 7500 ft.: coastal S. Cal.; Sierra Nevada; Coast Ranges. June-July. (Var. trifidum Gray. Var. latum Hall.) Var. TANACETIFLÒRUM Jepson n. comb. Plants coarse, 2¼ ft. high; leaves ½ to 1½ in. long; cymes fewer (3 to 6)-headed.—Mariposa Co. (E. tanacetiflorum Greene.) Var. LAXIFLÒRUM Gray. Inflorescence more lax, the heads umbellate or umbellately corymbose.—Mts. of S. Cal.; n. to Santa Lucia Mts. Var. DISCOÍDEUM Greene. Plants condensed; heads broader, rayless.—Montane, 2000 to 7000 ft.: Sonoma Co. to San Gabriel Mts.

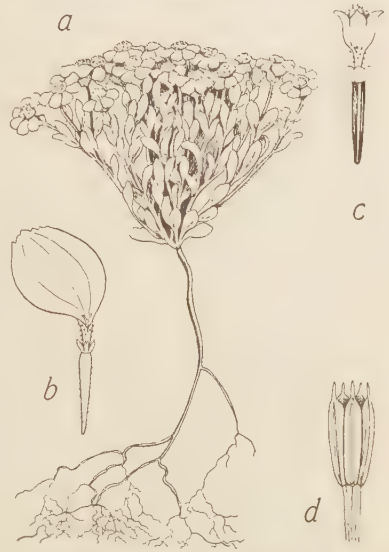
4. **E. multicáule** Gray. Stem branching mostly at the base, the branches usually many, erect or diffuse or sometimes forming loose mats, ½ to 5 in. long; upper part of plants white-woolly, sparsely woolly below; leaves cuneate, trifid or 5-toothed at apex, 2 to 4½ lines long; heads 1 to 2 lines high, leafy-bracteate, clustered at the ends of the branches; receptacle nearly flat; rays 3 to 7, yellow, 1 line long; achenes with scanty appressed hairs or subglabrate; pappus-paleae 10 to 15, narrow, awned, somewhat fimbriate, or lacking.—Sandy flats or mesas 10 to 1500 ft.: coastal S. Cal.; n. to the upper Salinas Valley and San Carlos Range; e. to Ariz. Apr.-June.

5. **E. prínglei** Gray. Stems many from the base, forming dense tufts 1 to 2¼ in. high; herbage densely white-woolly, or the stems glabrate in age; leaves 3-lobed at apex, narrowed to a slender base, 2 to 5 lines long; heads 2 to 2½ lines high, numerous, in close clusters at the ends of the branches; involucres narrow-campanulate, densely white-woolly; rays none; pappus-

paleae 4 or 5, broadly oblong to broadly lanceolate, silvery-scarious, erose or laciniate at apex.—Desert flats or arid slopes in mountain ranges near or bordering the Mohave Desert, 3400 to 6000 ft.: Hesperia; Swarthout Cañon; Little Rock Creek; Elizabeth Lake; Mt. Pinos; Greenhorn Range; Inyo Co.; e. to Ariz. May-June.

6. **E. mohavénse** Jepson n. comb. Caespitose plant, the stems, leaves and heads forming a dense rounded tuft ½ in. high; leaves cuneate-obovate, coarsely 3-toothed at apex; heads 3 or 4-flowered, 1¾ lines high, borne on slender peduncles; involucres cylindric, their bracts 3 or 4, linear, obtuse; pappus-paleae 11 to 13, linear to obovate, mostly obtuse.—Sandy gullies, Barstow, Mohave Desert. May. (Eremonanus mohavensis Jtn.)

7. **E. wallàcei** Gray. Fig. 985. Densely woolly compact plant with several to many ascending stems, 1 to 4 in. high; leaves spatulate to obovate, obtuse, mostly entire, 2½ to 6 lines long; heads showy, on peduncles 3 to 9 lines long; involucres 1½ to 2 lines high, their bracts overlapping, distinct; rays 6 to 10, oblong, yellow, 2 lines long; achenes very black, the pappus clear bright white; pappus-paleae 6 to 8, broad, short, obtuse, erose, ¼ to ½ as long as the corolla.—Sandy flats or mesas, 1200 to 3200 ft.: coastal S. Cal.; Colorado and Mohave deserts; Inyo Co.; e. to Ariz. and Utah. Mar.-May. Var. RUBÉLLUM Gray. Rays white or pale purple or rose-color and white.—Sw. side Colorado Desert: San Felipe; Vallecito. (Bahia rubella Gray.)



985. Eriophyllum wallacei Gray; *a*, habit x ½; *b*, ray-fl. x 5; *c*, disk-fl. x 5; *d*, anther-column x 11.

8. **E. ambíguum** Gray. Stem branched at and above the base, the branches slender, erect, ascending or diffuse, 3 to 12 in. high; herbage with rather thin tomentum, tardily deciduous above; leaves narrowly oblanceolate or spatulate to linear, entire or few-toothed, ½ to 1½ in. long; heads 5 to 7 lines broad, solitary at the ends of the branches, usually long-peduncled; involucres 2 to 3 lines high, the rigid carinate bracts about 8, distinct to the base or lightly united for about ⅔ the way from the base; receptacle acutely conical, chaffy to scrobiculate; rays about 8 (5 to 9), yellow, 2 to 4½ lines long; achenes appressed-pubescent; pappus-paleae quadratish, fimbriate, or none.—Montane, 4000 to 5700 ft.: Greenhorn Range; Inyo Co. May-June. (E. paleaceum Bdg.)

9. **E. congdònii** Bdg. Stem freely branched from near the base, erect or ascending, 9 to 15 in. high; herbage loosely tomentose or floccose, or the stems more or less glabrate; leaves oblanceolate or spatulate, entire or the lower somewhat toothed, 5 to 10 lines long; heads solitary at the ends of the branches, long-peduncled; involucre campanulate to sub-cylindric, 3 lines high; rays 2 lines long; corolla-tube of disk-flowers slightly or not at all glandular; achenes hirsutulose; pappus of 4 erose paleae alternating with 4 longer lanceolate ones.—Mariposa Co.: Merced Cañon; mts. near Hennesy.

10. **E. heermánnii** (Dur.) Greene. Stem branching at and above the base or sometimes simple, 3 to 7 in. high; leaves pinnately parted, 5 to 7 lines long, the lobes mostly toothed or again lobed or divided; petioles nearly as long or a little longer; heads 5 to 15 lines broad, solitary on peduncles terminating the branches, the peduncles often curved or recurved in fruit; involucres 1½ to 3½ lines high, their bracts about 8, distinct nearly to the

base; receptacle conical; rays yellow, conspicuous; disk-corollas glandular-pubescent on tube; achenes clavate, slightly pubescent; pappus none.—Foothills, 500 to 1500 ft.: Sierra Nevada foothills from Eldorado Co. to Tulare Co.; Tehachapi Mts. Apr.-June.

11. **E. jepsónii** Greene. Similar to no. 10; plants bushy, 1½ to 2½ ft. high; stems woody below, white with tomentum, the leaves soon green or greenish; leaves pinnately divided into 5 to 7 long narrowly linear lobes; heads peduncled in a loose corymb; involucres broadly campanulate-hemispherical, 2½ to 3 lines high, 8 to 12 lines broad, the bracts 6 to 8, ovate; rays elliptical or oblong, 4 lines long; achenes hispidulous; pappus-paleae in 2 unequal series, those of the inner set exceeding the outer.—Mt. Hamilton Range; Mt. Diablo. May.

12. **E. lanàtum** (Pursh) Forbes var. **integrifòlium** (Hook.) Smiley. Loose plants 5 to 11 in. high, the stems many from the branching root-crown; herbage white-woolly or partly glabrate; leaves obovate to linear, entire, toothed or lobed, drawn down to a narrow base, ¾ to 1¼ in. long; heads 6 to 10 lines broad, solitary on long naked peduncles; involucres broadly campanulate, 4 lines high; corolla-tube glandular; achenes pubescent, at least towards apex; pappus-paleae 6 to 8, subequal, lacerate, equaling or nearly equaling corolla-tube.—Montane, 4000 to 7000 ft.: Sierra Nevada from Tulare Co. to Lassen Co.; Lake Co. to Salmon Mts. July. (Bahia integrifolia DC.) All the varieties intergrade freely and intermediate states are abundant. Var. CUNEÀTUM Jepson n. comb. Similar to var. integrifolium; basal leaves spatulate-obovate or roundish-obovate, 3 (or 5)-toothed at apex, drawn down to a cuneate base or winged petiole, 3 to 9 lines long, much shorter than the cauline leaves, these oblanceolate or linear, entire or coarsely few-toothed; achenes glabrous, striate, sometimes papillate, sometimes pubescent; pappus rather short.—Montane, 4000 to 6000 ft.: Placer Co. to Lassen Co. (Bahia cuneata Kell.) Var. CRÒCEUM Jepson n. comb. Stems few or several from the base, 6 to 9 in. high, the heads 1 or 2 (or 3) and rather long-peduncled; leaves oblong-obovate to obovate, serrate or coarsely crenate on upper half, or entire, cuneate and entire below, thin, glabrate and green above, white-arachnoid beneath, 3 to 9 lines wide, ¾ to 1½ in. long; heads 1 to 1¼ in. wide; corolla-tube very glandular, granuliferous; achenes striate, minutely papillate, glabrous; pappus a minute ring of paleae or obsolete.—Open woods in the mts., 3500 to 5500 ft.: Sierra Nevada from Butte Co. to Tulare Co. June. (Eriophyllum croceum Greene.) Var. OBOVÀTUM Hall. Stems several to many from a decumbent base, usually simple, 9 to 12 in. high; herbage clothed with a dense woolly persistent tomentum; leaves ovate, obovate or oblong-obovate to oblanceolate or lanceolate, entire or nearly so, ½ to 1 in. long; heads solitary, 7 to 14 lines broad, on long mostly naked peduncles; involucres hemispheric, 4 to 5 lines high; rays about 11 to 13, deep yellow, 4 to 5 lines long; disk-corollas with glandular-puberulent tube; achenes glabrous or nearly so, striate, the paleae erose, obtuse.—San Bernardino Mts., 4000 to 7000 ft. June-July. (E. obovatum Greene. E. brachylepis Rydb.) Var. LANCEOLÀTUM Jepson n. comb. Stems ¾ to 1½ ft. high; herbage loosely but abundantly white- or yellowish-tomentose; leaves obovate to oblong, serrate at apex or above the middle, 1 to 1¼ in. long; naked peduncles 1 to 6 in. long, a little enlarged upward; heads 1 to 1½ in. broad; rays about 13; achenes slightly hispidulose, slightly glandular.—Humboldt Co. to Siskiyou Co., 500 to 4000 ft.; n. to Ore. June-July. (E. lanceolatum Howell.) Var. GRANDÍFLORUM Jepson. Stems several from the root-crown, simple or branched, erect, 12 to 17 in. high; under surface of leaves white-woolly, the upper surface green or greenish, the stems tending to become glabrate; leaves linear, entire or saliently toothed, pinnately and remotely few-lobed, 1 to 2 in. long; naked peduncles mostly very long (3 to 11 in. long); heads mostly 1 to 1½ in. broad.—Foothills, 200 to 4000 ft.: Sierra Nevada from Calaveras Co. to Butte and Plumas Cos.; w. Solano Co. to Humboldt and Siskiyou Cos. May-June. (E. caespitosum var. grandiflorum Gray.) Var. ACHILLAEÒIDES Jepson n. comb. Stems several to many from the shortly branched root-crown, erect or ascending, simple or branched, ⅔ to 2¼ ft. high; herbage thinly tomentose or glabrate, the upper surface of the leaves green or only

subglabrate, the lower surface persistently white-tomentose; leaves 6 to 10 lines long, once or commonly twice ternately divided into narrow lobes, the lobes ¼ to ¾ line wide, entire or toothed; petioles winged, 2 to 7 lines long; naked peduncles 1½ to 4 in. long; heads ¾ to 1⅛ in. broad.—Dry hills, 500 to 5000 ft.: Napa Co. to Siskiyou Co., thence se. to Eldorado Co. May-June. (Bahia achillaeoides DC. E. idoneum Jepson.) Var. ARACHNOÌDEUM Jepson n. comb. Similar to var. achillaeoides; leaves 1 to 3 in. long, not so deeply parted, pinnately and usually irregularly incised, green and glabrate above, thinly tomentulose below or subglabrate.—Hill slopes, 50 to 1500 ft.: Marin Co. to Humboldt Co. (Bahia arachnoidea Fisch. & Ave.-Lall.) Var. MONOÉNSE Jepson n. comb. Stems many, simple, erect or ascending from the depressed woody branches of the root-crown, 3 to 7 in. high, mostly leafy on lower part and at base; herbage persistently white-woolly; leaves linear-spatulate to spatulate-obovate or roundish-obovate with narrow base, entire or toothed at apex, 3 to 9 lines long; heads 8 to 11 lines broad; involucres 4 to 5 lines high; achenes striate.—High montane, 6000 to 11,000 ft.: Sierra Nevada from Fresno and Mono Cos. to Plumas Co. (E. monoense Rydb.)

13. **E. caespitòsum** Dougl. Stems several from the woody root-crown, branching, somewhat woody below, ⅓ to 1½ ft. high; herbage white-tomentose, the upper surface of the leaves green and glabrate; leaves somewhat rhombic, 4 to 9 lines long, deeply 3 to 5-lobed, the lobes dentate or entire, with revolute margins; petioles ¼ to 3 lines long, broadly winged; heads 1 to 1¼ in. broad; naked peduncles 1 to 2 in. long; involucres campanulate, 3 to 4 lines high; rays rather broad, 4 to 5 lines long; disk-corollas with densely glandular-hispid tube; achenes glabrous; pappus-paleae very small or lacking.—Bluffs or slopes along the sea, 10 to 500 ft.: Mendocino Co. to Marin Co. May-Sept. (E. brownii Eastw.) It intergrades to E. lanatum var. arachnoideum and var. achillaeoides.

112. SÝNTRICHOPÁPPUS Gray

Low white-woolly annuals. Leaves entire or 3-lobed at the apex, mostly alternate. Heads small, radiate. Ray-flowers yellow or rose-purple; disk-flowers yellow. Involucre narrow, its bracts 5 to 8, narrow, partly enfolding the ray-achenes. Receptacle flat. Achenes linear-turbinate, pubescent. Pappus of numerous bristles united at base, or none. (Greek syn, together or united, thrix, hair, and pappos, pappus.)

Leaves alternate; rays yellow; pappus of numerous awns. . . 1. *S. fremontii.*
Leaves chiefly opposite; rays rose-purple, edged or marked with white; pappus none. . . . . 2. *S. lemmonii.*

1. **S. fremóntii** Gray. Fig. 986. Stem much branched from the base, diffuse, 1½ to 5½ in. high; leaves linear, linear-spatulate or cuneate, sometimes 3-lobed at apex, gradually drawn down to a petiole-like base, the whole 3 to 9 lines long; heads numerous, terminal on the branchlets, short-peduncled; involucre 2½ to 3 lines high, its bracts narrowly scarious-margined; rays golden yellow, 1½ to 3½ lines long; pappus bright white, the numerous barbellate bristles somewhat united at base, deciduous.—Desert plains and mountain slopes, 2000 to 3000 ft.: Mohave Desert and slopes of its bordering mountains; Inyo Co.; e. to Utah and Ariz. May.

986. Syntrichopappus fremontii Gray; *a*, habit x ¾; *b*, ray-fl. x 2½; *c*, disk-fl. x 2½; *d*, portion of pappus spread out x 5.

2. **S. lémmonii** Gray. Stem much-branched from the base and diffuse, or sometimes nearly simple and erect, 1¾ to 2¾ in. high; herbage glabrate in age; leaves linear or entire, 2½ to 4 lines long; involucres 2 to 2½ lines high, their bracts 6 to 8, narrowly oblong, linear-spatulate, scarious-margined; rays 7 or 8, commonly almost white above, deep rose or pink with dark-red veins beneath, the margins white; pappus none.—Arid valley floors or cañon flats, 2000 to 4300 ft.: Antelope Valley, w. Mohave Desert; Cajon Pass.

113. **BAHÌA** Lag.

Herbs. Leaves opposite, or in ours alternate, finely divided. Heads radiate, in loose cymes. Involucre hemispherical, about 20 to 50-flowered, its bracts plane or merely concave, equal, in a single series or nearly so. Flowers yellow. Achenes 4-sided, or somewhat flattish and keeled on both sides. Pappus of several scarious paleae or none. (J. F. Bahia, Professor of Botany, University of Bologna.)

987. Bahia dissecta Britt.; *a*, *b*, habit x ½; *c*, ray-fl. x 3; *d*, disk-fl. x 3.

1. **B. dissécta** (Gray) Britt. Fig. 987. Stems erect, 9 to 12 in. high, few or several from a shortly branched biennial or perennial root-crown; herbage puberulent, the inflorescence and involucres with gland-tipped hairs; leaves round-ovate or orbicular in outline, 6 to 8 lines long, once or twice divided or cleft into elliptic or oblong lobes; heads 6 to 7 lines broad; rays 2 lines long; corolla-tube villous-glandular; achenes striate, subglabrate or very sparsely hispidulose; pappus none.—Montane, 6600 to 8600 ft.: South Fork Santa Ana River, San Bernardino Mts. (F. W. Peirson); e. to Wyo., Col. and N. Mex. (B. chrysanthemoides Gray. Villanova dissecta Rydb.)

114. **BLENNOSPÉRMA** Less.

Low annual herbs with alternate pinnately parted leaves and peduncle-like branches bearing solitary heads of yellow flowers. Bracts of the involucre oblong, united about ⅓ or ½ the way from the base. Ray-flowers fertile; disk-flowers perfect but sterile. Achenes obovate, densely covered with minute papillae. Pappus none. (Greek blenna, mucus, and sperma, seed, the surface of the achene becoming conspicuously mucilaginous when moistened.)

1. **B. califórnicum** T. & G. Stem branching at or near the base, the branches becoming diffuse, 3 to 7 in. high, often naked above; herbage glabrous, slightly succulent; leaves parted into narrowly linear remote lobes; involucre greenish with purple markings; ray flowers 8 to 13, the ligule of the corolla 2 to 3 lines long, or the alternate pistils destitute of corolla; style-branches of ray-flowers broad; disk-flowers 20 to 45, shorter than the involucre, their styles undivided, capitate at summit; achenes obscurely 8 to 10-ribbed.—Moist ground, low open hills, 50 to 1000 (or 3000 ft.): Placer Co.; Coast Ranges from Mendocino and Lake Cos. to San Luis Obispo Co.; s. to Cuyamaca Mts. Feb.-Apr.

115. **PERÍTYLE** Benth.

Annual or biennial herbs. Herbage glabrous or viscid-pubescent. Leaves alternate, petioled, the lower often opposite. Heads numerous, radiate, many-flowered. Involucral bracts in a single series, the margins overlapping, carinate on the outside, grooved inside and partly embracing the ray achenes.

Rays short, white or yellow. Disk-flowers yellow, 4-toothed. Achenes flat, callus-margined, the margin ciliate. Pappus in ours a crown of scales, commonly with a slender awn from one or both angles. (Greek, peri, around and tyle, callus, the achenes callous-margined.)

1. **P. emòryi** Torr. Stem freely branching, ½ to 2 ft. high, the branches striate, widely spreading; herbage glandular-pubescent, ill-scented; leaves cordate in outline, ¼ to 1½ in. wide, palmately and rather shallowly 5 to 9-lobed or -cleft, the divisions toothed or serrate; petioles ½ to 1½ times as long; peduncles ⅛ to 1½ in. long; heads 3¼ lines high; outer involucral bracts oblong, acute, the inner narrower, scarious-margined; rays about 12 to 15, ¾ to 1½ lines long; corollas glandular-pubescent; achenes somewhat flattened, oblong to subclavate, black, glabrous or rarely puberulent on the sides, the margins hispid-ciliate; pappus an inconspicuous erose or lacerate crown and a single slender awn about as long as the achene, or the awn often wanting. — Hill slopes: cismontane S. Cal. (infrequent); Colorado Desert; e. Mohave Desert; Panamint Range; e. to Ariz., s. to Mex. (P. californica Benth.)

116. **EATONÉLLA** Gray

Floccose-woolly annuals. Leaves mostly alternate or basal. Flowers white or yellow. Heads subsessile in small glomerules or short-peduncled. Involucral bracts 5 to 8, oval or oblong, obtuse, distinct. Receptacle hardly convex. Rays very small or none. Disk-corollas 4-toothed. Achenes black, flattened, callous-margined, densely ciliate-villous. (Daniel Cady Eaton, one-time Professor of Botany in Yale College, author of Ferns of North America and the Compositae of King's Expedition).

Plants forming compact or depressed tufts, ½ to 1½ in. high; leaves entire; rays little exceeding the disk; pappus-paleae awned.....1. *E. nivea.*
Plants loosely branching, with several stems from the base, 3 to 12 in. high; leaves sinuate-dentate; ray-flowers none; pappus-paleae not awned.....2. *E. congdonii.*

1. **E. nivea** Gray. Plant forming a compact depressed densely leafy tuft ½ to 1½ in. high, the stems very short, few or several, and the leaves mostly basal; herbage loosely white-woolly; leaves spatulate-obovate to linear-spatulate, entire, 3 to 11 lines long, equaling or surpassing the heads; involucres of 8 to 12 linear bracts; rays purplish or yellowish, ¾ to 1 line long, little exceeding the disk; achenes linear-clavate, compressed, the black sides polished and shining, the margin heavily ciliate-villous with long white hairs; pappus-paleae 2, broadly ovate, or quadratish, sparingly toothed or erose, produced at apex into a subulate awn as long as the paleaceous portion.—Washes or sandy flats, 4000 to 5500 ft.: e. side Sierra Nevada from Inyo Co., Cal., to Washoe Co., Nev.; n. to eastern Ore.

2. **E. congdònii** Gray. Stems several or many from the base, ascending, sparsely leafy, 3 to 12 in. high; herbage floccose-woolly; leaves linear to oblong, sparsely sinuate-dentate or some subentire, sessile or narrowed to a margined petiole, the whole ½ to 2 in. long; heads short-peduncled or nearly sessile in terminal clusters; involucral bracts 5 or 6, ovate, herbaceous; ray-flowers none; achenes oblong, flattened, or some of the outermost triangular-obcompressed, the sides black, shining, glabrate, the margin with very dense or matted border of long yellowish hairs; pappus-paleae 2 to 4, quadratish, erose-laciniate, very thin, not awned, much shorter than the ciliate hairs.—Low foothills bordering the upper San Joaquin Valley and the neighboring plains, 400 to 1200 ft.: Alcalde; Lerdo; Oil City; Deer Creek. Apr.

117. **LAPHÀMIA** Gray

Ours a low perennial herb. Leaves small, petioled. Flowers yellow, in small heads terminating the branches or branchlets. Involucral bracts in a single series. Rays in ours none; disk-corollas 4-toothed. Pappus none or of 1 to many bristles. Achenes flat. (Dr. I. A. Lapham, amateur Wisconsin botanist.)

1. **L. megacéphala** Wats. Stems several to many from the crown of a thick taproot, forming an intricately branched rounded bushy plant 12 to 15 in. high; herbage minutely puberulent; leaves alternate, ovate, few-toothed above the base or entire, 2 to 5 lines long, on petioles half to nearly as long;

heads bright brownish yellow, 3½ to 4 lines high; involucral bracts oblanceolate or narrow-obovate, slightly glandular-puberulent, sometimes woolly at tip; achenes puberulent or somewhat ciliate; pappus-bristles 1 or none.—White Mts., Inyo Co.; e. to southern Nev. (Monothrix megacephala Rydb.)

118. **RIGIOPÁPPUS** Gray

Slender annuals. Leaves alternate, very narrowly linear, entire. Heads small, turbinate, solitary on the simple stems or on the branches, which are proliferous. Receptacle flat. Bracts subulate, similar to the upper leaves. Flowers yellow. Ray-corollas not exceeding the disk, the ray not longer than the tube. Disk-corollas small, with 3 to 5 short erect teeth. Pappus in disk and ray of 3 to 5 subulate awns. Achenes linear. (Greek rigios, stiff, and pappos, pappus.)

1. **R. leptócladus** Gray. Fig. 988. Plants 3 to 11 in. high, the branches filiform; herbage short-hairy or nearly glabrous; leaves ½ to 1¼ in. long; heads 2 to 3 lines high in anthesis; achenes hispidulous.—Wooded hills, 500 to 5000 ft.: n. Los Angeles Co. to Santa Barbara Co.; Coast Ranges from Monterey and w. Fresno Cos. to Humboldt and Siskiyou Cos.; Sierra Nevada foothills from Kern Co. to Lassen Co.; n. to Wash. Apr.-June. Var. LONGIÁRISTÀTUS Gray. Involucres 2 lines high; pappus-awns mostly 3, more slender, subulate-dilated at base, exceeding the corolla, somewhat longer than the achene.—Rattlesnake Bar.

988. Rigiopappus leptocladus Gray; *a*, habit x ⅓; *b*, disk fl. x 3; *c*, involucral bract x 2½.

119. **AMBLYOPÁPPUS** H. & A.

Low annual with gummy sweet-scented herbage. Leaves linear and entire, or the lower pinnately divided into 3 or 5 filiform segments. Heads small, discoid, yellowish, in a terminal cymose panicle. Involucral bracts 5, in a single series, broadly obovate, concave, wholly herbaceous. Receptacle small, conical Achenes short-clavate, 4-angled. Pappus of 8 to 12 short obtuse paleae, often colored. (Greek, amblus, blunt, and pappos, pappus.)

1. **A. pusíllus** H. & A. Stem simple below, paniculately branching above, 4 to 8 (or 16) in. high; involucres campanulate, 1½ lines high; flowers in a head 14 to 23; pappus-paleae oblong to roundish.—Near the sea, in saline soils or borders of salt marshes: San Luis Obispo Co. to San Diego Co.; Santa Barbara Isls.; s. to L. Cal.; Peru; Chile.

120. **CHAENÁCTIS** DC.

Annual or perennial herbs. Leaves alternate, pinnately parted or dissected or sometimes entire. Heads peduncled, solitary or cymosely arranged. Flowers white or yellow. Bracts of the campanulate or turbinate involucre herbaceous, linear to lanceolate, commonly equal and in one series. Receptacle flat, naked (except in C. carphoclinia). Corollas regular, with short tube and long throat, the marginal corollas in some species with the limb palmately enlarged, forming a kind of ray. Pappus of hyaline paleae, the paleae in the outer flowers of the head commonly shorter and fewer. (Greek chaino, to gape, and aktis, ray, in reference to the marginal flowers of one section of the genus.)

A. Annuals.

Pappus none or of deciduous erose or fimbriate paleae.
Leaves 2 or 3 times pinnately parted or divided; heads many-flowered.....
1. *C. artemisiaefolia.*
Leaves linear or filiform, entire; heads 4 to 8-flowered.....2. *C. thysanocarpha.*
Pappus of persistent entire or erose paleae.
Flowers yellow.....3. *C. glabriuscula.*
Flowers white or purplish-tinged.
Stamens exserted from corolla-tube.
Involucral bracts attenuate at apex into a setaceous or awn-like point; receptacle with slender or awn-like bracts.....4. *C. carphoclinia.*
Involucral bracts obtuse or acute; receptacle naked.
Leaves pinnatifid with short thick lobes..... .....5. *C. stevioides.*
Leaves entire or with elongated slender lobes.
Marginal corollas often much enlarged, sometimes developing a 4 or 5-cleft ligule; pappus-paleae in one circle, the paleae equal or unequal .....6. *C. fremontii.*
Marginal corollas scarcely larger than the inner; pappus-paleae in 2 very unlike and unequal circles.....7. *C. xantiana.*
Stamens included in corolla-tube.....8. *C. macrantha.*

B. Perennials (or no. 11 sometimes biennial); pappus of 8 to 15 equal paleae.

Alpine dwarf 1 to 3 in. high; involucres and peduncles permanently tomentose, not glandular; peduncles not bracteate .....9. *C. nevadensis.*
Plants mostly ½ to 2 ft. high; involucres and peduncles densely glandular-pubescent (except in no. 12); peduncles commonly bracteate, sometimes very sparingly so.
Involucral bracts equal, linear-attenuate, acuminate, equaling or slightly exceeding the corollas; leaf-divisions linear.....10. *C. suffrutescens.*
Involucral bracts usually more or less unequal, linear, acute or obtuse, mostly surpassed by the corollas.
Heads several to many in a corymbose cluster; stems leafy.....11. *C. douglasii.*
Heads solitary or the stems forked and 2 or 3-headed.
Herbaceous; leaves basal or sub-basal, 1½ to 4 in. long.....
12. *C. santolinoides.*
Woody below; stems more or less leafy, the leaves about ½ to 1 in. long...
13. *C. parishii.*

1. **C. artemisiaefòlia** Gray. Fig. 989. Stem erect, branching, leafy, 1 to 3 ft. high; herbage mealy-pubescent below, the upper portion of the stem and involucre glandular-hirsute and viscid; leaves broadly ovate in outline, 2 to 7 in. long, twice or thrice pinnately parted or divided into oblong or linear divisions; petioles 2 lines to 2 in. long; heads hemispheric, ½ to 1 in. broad; involucres 4 to 6 lines high, their bracts linear-lanceolate, mostly in a single series; flowers white, the marginal corollas not obviously enlarged; corolla transparent or lucid, its lobes a little roughened inside; achenes linear-clavate, flattened, glabrous or somewhat hispid; pappus none or rarely of deciduous fimbriate paleae.—Foothills, 500 to 2500 ft.: Santa Monica and San Gabriel mountains to San Diego Co. June.

989. Chaenactis artemisiaefolia Gray; *a*, leaf x ½; *b*, portion of an infl. x ½; *c*, fl. x 2.

2. **C. thysanocárpha** Gray. Stem slender, branched, 3 to 9 in. high; herbage arachnoid, glabrate in age; leaves linear or filiform, entire, ½ to 1½ in. long; heads terminal on the branches, 3 to 4 lines high; involucral bracts 4 to 8, linear-oblong, 4 to 8-flowered; corollas yellow; achenes clavate, striately and finely many-nerved, glandular-dotted; pappus-paleae 11 to 17, narrow-obovate, erose or irregularly laciniate on the sides, deciduous in a ring.—Granitic sand,

8000 to 10,000 ft., region of Mt. Whitney: Whitney Mdws.; Soda Creek; Long Mdw. Aug.-Sept. (Bahia palmeri Wats. Orochaenactis thysanocarpha Cov.)

3. **C. glabriúscula** DC. Stem branching at or above the base, 5 to 11 (or 19) in. high, the branches ending in rather long one-headed peduncles; herbage thinly floccose, at length glabrous; leaves oblong to roundish in outline, ½ to 1½ in. long, once or twice pinnately parted into narrowly linear lobes, the lobes most commonly short, 1 to 3 lines long, or sometimes to 8 lines long; uppermost leaves linear and merely toothed or entire; heads 4 to 5 (or 8) lines broad; bracts of the involucre thickish; marginal corollas ample, conspicuously longer than those of the disk; pappus-paleae 4 (sometimes 5), oblong-lanceolate, those of the disk equal, those of the marginal achenes 1 or 3 long and 3 short; short paleae of the ray achenes relatively broader or even elliptical.—Foothills and valleys, 300 to 4000 ft.: coastal S. Cal.; South Coast Ranges; Sierra Nevada foothills from Kern Co. to Shasta Co. Apr.-June. Var. FILIFÒLIA Jepson n. comb. Very slender; leaves or the lobes very slenderly filiform; heads 2½ to 3½ lines broad; marginal corollas little enlarged; pappus-paleae commonly 5, unequal, oblong-oblanceolate, with 2 very small roundish outer ones.—Dry hills: Napa Range: San Diego Co. (C. filifolia H. & G. C. gracilenta Greene.) Var. ÓRCUTTIÀNA Hall. Stouter than var. tenuifolia; leaves 2 or 3 times pinnatifid, the lobes very short, obtuse; peduncles and involucres a little glandular-puberulent; involucral bracts linear, acute; marginal corollas regular; pappus-paleae of disk-flowers nearly equaling the corolla, acute.—Seabeaches, San Diego Co. May-June. (C. tenuifolia var. orcuttiana Greene.) Var. LANÒSA Hall. Plants 4 to 12 in. high, leafy only at base and bearing at the base naked simple scape-like peduncles ending in large (8 to 9 lines broad) heads; herbage lanate or the tomentum deciduous; leaves thickish, simply pinnate with few narrowly linear and mostly short lobes or the upper entire; pappus equal or nearly equal, narrowly oblong or oblong-lanceolate, acutish.—Sandy valleys or flats: coastal S. Cal.; sw. Mohave Desert; Monterey Co.; lower San Joaquin Valley. Mar.-June. (C. lanosa DC.) Var. HÉTEROCÁRPHA Hall. Stem branching at or above the base (as in all the following varieties except the last): heads on long peduncles; pappus-paleae of disk-achenes 4 or 5, elliptic-oblong, nearly equaling the corolla, and with an outer series of 2 or more, these roundish, very short or minute; paleae of marginal flowers much shorter.—North Coast Ranges; upper Sacramento Valley; Sierra Nevada. (C. heterocarpha Gray.) Var. CÚRTA Jepson n. comb. Heads frequently small; pappus-paleae 4 or 5, in one series, broadly oblong, equal or unequal, less than half as long as the corolla, sometimes reduced to a mere crown.—Greenhorn Mts. to San Luis Obispo Co. and w. Riverside Co. (C. heterocarpha var. curta Gray.) Var. TÉNUIFÒLIA Hall. Slender; leaves or their divisions usually filiform and often elongated; involucral bracts linear, thin, acute; marginal corollas often enlarged but seldom exceeding the disk; pappus-paleae of disk-flowers equaling the corolla, acute, those of the marginal flowers similar or much shorter and obtuse.—Light sandy soil, frequent: Santa Barbara to San Diego, e. to San Jacinto Mts. (C. tenuifolia Nutt.)

4. **C. carphochlmia** Gray. Stem freely branched from above the base, often bushy, 4 to 12 (or 22) in. high, the branches slender; stems, leaves and involucres finely mealy-pubescent; leaves ½ to 2 in. long, once or twice pinnately parted into linear or filiform quite remote lobes; heads numerous, 3 to 6 lines broad; involucres 3 to 3½ lines high, their bracts linear-lanceolate, tapering into subulate often pinkish awns; receptacle with 5 to 10 rigid persistent and filiform or awn-like bracts about equaling the flowers; achenes villous with ascending hairs; paleae of disk-achenes usually 4, narrowly lanceolate, acuminate, a little shorter than the corollas, the marginal or sometimes the inner ones short, broad and obtuse.—Deserts, 100 to 2000 ft.: Colorado Desert; Mohave Desert; Inyo Co.; e. to Nev., Utah and Ariz., s. to L. Cal. Apr.-May. Var. ATTENUÀTA Jones. Pappus-paleae of even the central flowers very short, obtuse or acute, ⅓ as long as the corolla.—Inyo Co.; Colorado Desert; e. to Ariz., s. to L. Cal. (C. attenuata Gray.)

5. **C. stevioides** H. & A. Stem branching at or above the base, erect, 3 to 12 (or 16) in. high; herbage floccose- or arachnoid-tomentose, more or less glabrate; leaves ½ to 1¾ in. long, once or twice pinnately parted into few or many linear lobes 1 to 3 lines long, or some of the upper entire; heads on short slender peduncles in an open or somewhat close cyme; some of the marginal corollas more or less enlarged; involucres 2½ to 3½ lines high; bracts obtuse or acutish; achene hispidulous; pappus-paleae of disk-achenes 4, quadratish to oblong-lanceolate, acute, unequal, ½ to nearly as long as the corolla.—Sandy flats in the deserts, 2000 to 6000 ft.: Colorado and Mohave deserts; e. to Ariz. and Nev., thence n. to Ida. June. Var. BRACHYPÁPPA Hall. Leaf-segments thick and short; marginal corollas not enlarged; pappus reduced to a mere crown of obtuse or erose paleae or sometimes one of the paleae twice as long (½ to 1 line) as the others.—Desert slopes, 5000 to 7500 ft.: Ventura, n. Los Angeles, Kern and Inyo Cos.; Ord Mts., Mohave Desert; Colorado Desert. Mar.-June.

6. **C. frémóntii** Gray. Stem branching at or above the base, 2 to 16 in. high; herbage glabrate, sometimes slightly woolly; leaves ¾ to 2 in. long, narrowly linear and entire, or once pinnately parted into linear lobes; branches ending in a long peduncle bearing a single head; involucral bracts broadly linear, acutish; marginal corollas often much enlarged and irregular, sometimes developing a cuneate 4 or 5-cleft ligule; achenes hispidulose; pappus-paleae of central flowers usually 4 to 6, lanceolate, nearly equaling the corolla, sometimes the paleae, especially in marginal flowers, 1 long and several shorter.—Inyo Co.; Mohave and Colorado deserts; e. to Ariz. Mar.-May.

7. **C. xantiàna** Gray. Stem branched at or above the base, 7 to 13 in. high, the branches stout and somewhat fistulous; herbage glabrate or some woolliness persistent; leaves ¾ to 1¾ in. long, linear and entire or pinnately parted into linear lobes, sessile or shortly petioled; heads ½ to ¾ in. broad, borne on stout peduncles; involucral bracts strongly 1-nerved, shorter than the disk or often with spreading foliaceous tips longer than the disk; flowers white or flesh-color, the marginal ones scarcely enlarged; achenes hispid; pappus double, the inner row of paleae linear, 3 to 4 lines long, as long or nearly as the corolla, the outer row of paleae orbicular, ⅓ line long.—Ranges bordering or in the deserts, 3500 to 6500 ft.: e. San Diego Co.; San Gabriel Mts. to Mt. Pinos; s. Sierra Nevada in Tulare Co.; New York Mts.; n. along e. side Sierra Nevada to Lassen Co.; n. to eastern Ore. May-June.

8. **C. macrántha** Eat. Stems few or several from the base, ascending, 3 to 7 in. high, leafy at base and sparingly so upward, simple and ending in a single head or branched and 2 to several-headed, the peduncles ½ to 3 in long, sparingly bracteate or naked; herbage floccose-tomentulose; leaves ovate to roundish in outline, 3 to 9 lines long, once or twice pinnatifid, the lobes oblong, crowded; petioles nearly as long to twice as long; heads broadly turbinate, 2½ to 5 (or 6) lines broad; involucral bracts linear, acuminate; corollas pinkish, much exceeding the involucre; pappus-paleae 4, oblong-linear, ½ as long as the corolla, also with 2 very short outer ones or these sometimes obsolete.—Desert plains and slopes, 2000 to 4000 ft.: Mohave Desert; Inyo Co.; e. to Utah and Ariz. May.

9. **C. nevadénsis** Gray. Stems several, ascending, 1 to 3 in. high, arising from the simple or branched crown of the taproot and ending above in one-headed peduncles, the leaves borne in tufts on the root-crown or the end of its branches; herbage permanently white-tomentose, not glandular; leaves ovate or roundish in outline, 2 to 9 lines long, once or twice pinnatifid or pinnately parted into obovate or spatulate-linear lobes about 1 or 2 lines long; heads 2½ to 4 lines broad, the peduncles ½ to 2 in. long; involucral bracts linear, obtuse.—Alpine, 8500 to 12,000 ft.: Sierra Nevada from Mt. Whitney to Pyramid Peak, Mt. Rose and Lassen Peak; nw. to Mt. Shasta. July-Sept.

10. **C. suffrutéscens** Gray. Stems several to many, erect or ascending from short decumbent woody branches of the root-crown, 8 to 14 in. high; herbage

990. Chaenactis douglasii H. & A.; *a*, habit x ½; *b*, leaf x 1; *c*, disk-fl. x 1½.

white-tomentose or the leaves eventually green and more or less glabrate; involucres and peduncles densely glandular-pubescent; leaves ovate in outline, ½ to 2 in. long, pinnately parted into 5 to 7 lobes, the lobes narrowly linear, entire or rarely 1 or 2-toothed; petioles about as long; heads 6 to 11 lines broad, long-peduncled, solitary on the ends of the stems or branches; involucral bracts linear-attenuate; pappus-paleae 10 to 13, linear or narrowly oblong, a little shorter than the corolla, or in the outermost flowers much shorter.—Dry plains or slopes, 3800 to 6800 ft., Siskiyou Co.: Toad Lake; Edgewood; Shasta Valley; Mt. Shasta. June.

11. **C. douglásii** H. & A. Fig. 990. Stem simple or branching, erect, ½ to 2 ft. high; herbage flocculent-tomentose to glabrate; peduncles and involucres glandular-puberulent; leaves ovate to oblong-lanceolate in outline, ½ to 2 in. long, bipinnately parted into crowded lobes, the lobes short, obtuse, ¼ to 2 lines long; heads several to many, corymbosely cymose, 5 to 8 lines broad; involucres 3½ to 5 lines high, their bracts linear, mostly obtuse, somewhat unequal; pappus-paleae 9, ligulate to narrowly cuneate, ½ to ¾ as long as the corolla, or in marginal flowers shorter and broader.—Montane, on sandy or gravelly flats, 4000 to 9000 ft.: Sierra Nevada from Tulare Co. to Modoc Co.; North Coast Ranges from Lake Co. to Siskiyou Co.; n. to Wash., e. to Col. June-July. Var. ALPÌNA Gray. Dwarf tufted perennial from a somewhat woody base, 3 to 5 in. high; herbage densely white-tomentose below, the involucres and peduncles densely glandular-puberulent; leaf-divisions very broad and obtuse.—Montane, 6000 to 8500 ft.: Nevada Co. to Siskiyou Co.; n. to Wash., e. to Wyo. July-Aug.

12. **C. santolinoides** Greene. Fig. 991. Stems scapose and 1-headed, or sometimes forked and 2 or 3-headed, 2 to 11 in. high, arising from a basal tuft of leaves crowded on the branched root-crown; basal herbage densely and permanently white-tomentose, the upper parts glandular-pubescent; leaves oblong in outline, 1½ to 4 in. long, pinnately parted into many divisions, the divisions oblong, short, few-lobed, crispate; heads broadly turbinate, 5 to 7 lines broad; involucral bracts oblong, obtuse, obscurely nerved, a few of the outer ones commonly very short and spreading; achenes densely hispid; pappus-paleae 8 to 10, exceeding or a little shorter than the corolla.—Montane, dry slopes or open pine forest, 5500 to 9000 ft.:

991. Chaenactis santolinoides Greene; *a*, habit x ½; *b*, fl. x 1½.

San Bernardino Mts.; Mt. San Antonio; Mt. Pinos; Pah Ute Peak, Kern Co. June.

13. **C. parishii** Gray. Stems several to many, erect, arising from a branched woody base, ⅔ to 2 ft. high, leafy at base and on lower part, sparingly leafy-bracteate or nearly naked above and bearing a single head or branched and bearing 2 or 3 long-peduncled heads; herbage white with close wool, glabrate above; involucre sometimes minutely glandular; leaves oblong in outline, ½ to 1 in. long, pinnately parted, the lobes linear, obtuse, mostly entire, about 2 lines long; heads 5 to 8 lines broad; involucral bracts very unequal, loose, linear, obtuse, pappus-paleae 9 to 15, linear, nearly as long as the corolla.—Montane, 5000 to 7000 ft.: San Jacinto and Santa Rosa mountains; s. to L. Cal. June-July.

121. **PALAFÓXIA** Lag.

Herbs or sometimes woody-based plants. Stem branching, bearing loosely cymose heads. Leaves alternate, entire. Flowers whitish, but the heads pinkish on account of the elongated pink styles. Heads discoid, rather narrow. Involucre oblong or campanulate. Bracts of the involucre subequal, linear, mostly in a single series, lightly clasping the outer achenes. Receptacle flat. Corollas all alike or sometimes the outer with unequal lobes; throat long. Style-branches elongated, puberulent throughout. Achenes slender, pubescent, as long as the involucre, the exserted pappus conspicuous. Pappus of 4 to 8 slender unequal paleae nearly as long as the achene. (Jose Palafox, Spanish patriot and general, noted defender of Saragossa against Napoleon's armies.)

1. **P. lineàris** Lag. Fig. 992. Erect branching annual ¾ to 2 ft. high, the branches ending above in loosely cymose heads, or some of the plants becoming perennial, woody at base and diffuse; herbage scabrous or hispid, the leaves canescent; leaves linear or linear-lanceolate, ¾ to 2½ in. long, the petioles 2 to 5 lines long; involucres 6 lines long, the flowers 10 lines long with long-exserted pink styles; paleae 4 (sometimes 5), narrowly linear, acute, unequal, with very strong midrib and narrow membranous margins, or with 2 or all of the paleae very short and blunt, especially in the outer flowers.—Desert washes or dunes, Colorado and Mohave deserts; n. to Coso Mts.; e. to Ariz., s. to Mex. Pappus paleae sometimes notched.

992. Palafoxia linearis Lag.; *a*, leaf x ½; *b*, fl. branchlet x ½; *c*, fl. x 1½.

122. **TRICHOPTÍLIUM** Gray

Low loosely woolly desert annual. Leaves alternate or the lower opposite. Heads yellow, discoid, solitary on slender ascending peduncles, or the earlier peduncles scape-like. Involucre hemispherical, its bracts 15 to 20, somewhat in 2 series, nearly equal, ovate-lanceolate, acute, a few inner ones spatulate and obtuse. Corolla with very short proper tube and elongated throat, the short lobes pubescent externally, spreading; outer corollas slightly enlarged. Style-branches linear, obtuse. Achenes oblong-turbinate, hirsute. Pappus-paleae 5, dissected into slender bristles, the middle ones of each

palea little shorter than the corolla, the outer regularly shorter. (Greek trichos, hair, and ptilon, feather, the pappus-paleae feathery-dissected.)

1. **T. incisum** Gray. Stem diffusely much-branched, forming plants 2 to 6 in. high and sometimes twice as broad; leaves and branches loosely white-woolly, the leaves at last green and subglabrate; leaves rather densely tufted on the upper part of the branches, narrowly spatulate to obovate, entire or incised-serrate, ½ to 2 in. long, narrowed below to a margined petiole; peduncles slender, naked, glandular-pubescent, not woolly, 1 to 3¼ in. long; heads 3 to 4 lines high; bracts of the involucre linear-lanceolate; pappus clear white, sometimes reddish brown.—Stony soil in the deserts, 100 to 1500 ft.: Colorado Desert; e. to Ariz., s. to L. Cal.

123. **HYMÈNOPÁPPUS** L'Her.

Perennial herbs with sulcate or channeled stems. Leaves mostly basal, the cauline alternate, pinnately parted or divided. Heads discoid, borne in an open paniele or solitary and terminal on the elongated peduncles. Involucre campanulate or hemispheric, its bracts 6 to 12, in 2 series, broad, the margins scarious and often colored. Corolla with narrow tube, the throat cylindric, abruptly dilated, its lobes spreading or recurved. Achenes obpyramidal, 4 or 5-angled. Pappus of 10 to 20 thin obtuse or awned paleae, sometimes reduced or none. (Greek humen, membrane, and pappos, pappus, the paleae hyaline.)

Pappus-paleae not awn-tipped; flowers yellow.....1. *H. filifolius.*
Pappus-paleae awn-tipped; flowers white or purplish.....2. *H. wrightii.*

1. **H. filifòlius** Hook. Stems several, erect, arising from the branched root-crown, 10 to 22 in. high, naked or nearly so, the cauline leaves mostly few, scattered and reduced; herbage densely white-woolly or slightly glabrate, the root-crown often with dense persistent floes of wool; basal leaves ovate or oblong in outline, 1 to 3 in. long, bipinnately divided into linear lobes, the petioles 1 to 1½ times as long; paniele very open, the few heads or peduncles 1 to 5¼ in. long; heads 5 to 6 lines high; bracts oval to oblong, obtuse, mostly equal, the scarious margins usually greenish; flower yellow; corolla-throat cylindric or a little narrowed downward, longer than the tube; achenes rather densely long-villous, at least on the angles; pappus-paleae about 14, equaling or a little exceeding the corolla-tube.—Foothills and mountain slopes and summits in or bordering the deserts, 4000 to 8000 ft.: Providence Mts.; e. to southern Nev., Ariz. and Neb. May-July. Var. LÙGENS Jepson n. comb. Bracts more distinctly unequal, the short outer ones with reddish brown margins, the inner ones with scarious-greenish margins.—Mountain slopes and summits, 5000 to 6500 ft.: San Bernardino Mts.; Santa Rosa Mts.; Cuyamaca Mts.; s. to L. Cal. June. (H. lugens Greene.)

2. **H. wrightii** Gray var. **viscídulus** Jepson n. var. Stems erect, few or several from the branched root-crown, 10 to 12 in. high; herbage glandular and hirsute; leaves roundish to ovate in outline, ½ to ¾ in. long, pinnately twice or thrice divided into somewhat crowded linear lobes, the petioles ½ to ⅔ as long; heads 4 to 5 lines high, few in open cymes; flowers white or purplish; involucral bracts linear-oblong, with broad scarious obtuse often erosulate types; achenes villous; pappus-paleae linear or lanceolate, the midrib continued as an awn nearly as long as the corolla.—Cuyamaca Mts., San Diego Co. (T. Brandegee, type). Oct.

124. **HYMENÓXYS** Cass.

Erect herbs with leafy stems bearing 1 to many cymose heads. Herbage aromatic. Leaves alternate, thickly punctate, pinnately parted or divided in ours. Heads radiate, long-peduncled, in loose cymes or solitary. Bracts of the involucre rigid, coriaceous, in 2 distinct series, the outer ones united at base. Receptacle convex or low conic. Flowers yellow. Ray-flowers fertile, the rays short and often broad, 3-toothed. Disk-flowers fertile. Achenes turbinate, hairy-pubescent. Pappus paleaceous, the paleae 5 to 12 hyaline, obtuse to awn-pointed. (Greek humen, membrane, and oxus, sharp, referring to the thin pointed pappus scales.)

Paleae of the pappus obtuse, erose at summit; outer bracts not punctate or only sparingly so ..... 1. *H. cooperi.*
Paleae of pappus acuminate or cuspidate.
Involucre hemispheric, about 6 lines broad; outer bracts 10 to 14, punctate.
Stems densely leafy; pappus-paleae lanceolate, gradually acuminate; achenes silky-villous with rusty hairs; Siskiyou Co. ..... 2. *H. lemmonii.*
Stems sparsely leafy; pappus-paleae ovate, abruptly acuminate; achenes silky-villous with white hairs; e. Mohave Desert ..... 3. *H. biennis.*
Involucre campanulate, 2½ to 4 lines broad; outer bracts 8 to 10, not punctate ..... 4. *H. chrysanthemoides.*

1. **H. cóoperi** (Gray) Ckll. Stem simple, leafy and leafy-tufted at base, 1¼ to 1¾ ft. high, arising from a perennial root, ending above in a cyme; herbage minutely puberulent; leaves ¾ to 3¼ in. long, pinnately 3 to 5-divided into 5 to 9 lobes, the lobes very narrowly linear, remote, ½ to 1½ in. long, or the lower twice-parted; cyme corymbose, few to several-headed; involucres hemispherical, their outer bracts 6 to 10; rays 3 to 5 lines long; achenes densely rusty-villous with ascending hairs; pappus-paleae 5, ovate or oblong, obtuse, erose at summit, about ½ or ⅓ as long as the pubescent or somewhat pruinose disk-corollas.—Providence Mts., e. Mohave Desert; e. to northern Ariz. June-Sept.

2. **H. lémmonii** (Greene) Ckll. Stems simple below, few or several from the branched perennial root-crown, leafy, 1 to 1½ ft. high; herbage glabrous; leaves 3 to 7 in. long, pinnately once or twice divided into long linear segments, the petioles ½ to 1½ times as long; heads several in somewhat corymbose cymes, the peduncles long or short; involucres hemispheric; outer bracts lanceolate, united at base, punctate; inner bracts ovate, erosulate, mucronate; rays about 12, 4 to 6 lines long; disk-flowers densely glandular; achenes densely silky-strigose with rusty hairs; pappus-paleae lanceolate, gradually acuminate, rusty-red.—Open valleys, 2000 to 3000 ft., Siskiyou Co.: Edgewood; Shasta Valley; Yreka; Montague; e. to Nev. June-July.

3. **H. biénnis** (Gray) Hall. Stems 1 or several from the base, usually much branched, purplish-brown, channeled, slightly mealy-pubescent, 1½ to 2¼ ft. high, arising from a biennial root; leaves 1 to 3 in. long, 3 to 5-parted into narrowly linear lobes, puberulent; heads loosely cymose, pedunculate; involucres hemispheric; outer bracts 12 to 14, broadly lanceolate, punctate, glandular-puberulent, united about ⅓ the way from the base; inner bracts slightly longer, with shortly acute tips; rays 10 to 14, yellow, 6 to 8 lines long; achenes densely silky-strigose; pappus-paleae round-ovate to lanceolate, erose, cuspidate-awned, about ¼ as long as the tomentulose disk-corolla.—Montane, 4000 to 6000 ft.: New York Mts., e. Mohave Desert; e. to Ariz. and Utah. July. (Actinella biennis Gray. Hymenoxys canescens var. nevadensis Ckll.)

4. **H. chrysànthemoides** DC. var. **excúrrens** Ckll. Annual; stem freely branching at or above the base, 10 to 20 in. high, the many branches ending in rather long-peduncled heads; herbage minutely pubescent, the growing parts somewhat tomentulose; leaves 1 to 1½ (or 2½) in. long, 3 to 5-parted into nearly filiform lobes, the lobes sometimes again divided; petioles about 2 to 10 lines long; involucres campanulate or subcylindric, 2¼ to 3 lines high; outer bracts commonly 7 or 8, oblong or lanceolate; inner bracts ovate, about half longer than the outer; rays 8 to 10 (or 12), yellow, 2½ to 4 lines long, merely toothed at apex; pappus-paleae ovate, pointed, ⅔ as long as the corolla.—Lowlands along the Colorado River from Palo Verde Valley to Yuma, 150 to 450 ft.; e. to Ariz., s. to Mex.

125. HÚLSEA T. & G.

Biennial or perennial montane herbs. Herbage balsamic-scented. Leaves mainly basal, sometimes alternate and sessile on the stems, the basal ones mostly drawn down to broad petioles. Heads rather large, radiate, yellow or purple, solitary or corymbose. Involucre many-flowered, its bracts in 2 or 3 series, narrow, acute. Receptacle flat. Achenes linear-cuneate, flattened or somewhat three-angled, soft-villous, especially on the margins. Pappus of mostly 4 truncate hyaline paleae, nearly entire or lacerate at the summit. (G. W. Hulse, U. S. army surgeon, who collected in California.)

Herbage viscid-pubescent (not woolly); stems equably leafy; leaves sessile; middle altitudes.
Rays 10 to 17, yellow, glabrous, 1½ lines broad.....1. *H. brevifolia.*
Rays 50 to 70, purple, hairy, ½ line broad.....2. *H. heterochroma.*
Herbage white-woolly when young, more or less denudate in age; leaves mostly with a broad petiole; rays yellow.
Leaves linear; alpine plants.
Involucral bracts oblong to ovate, acute; leaf-margins crinkled or crenate.....
3. *H. nana.*
Involucral bracts narrowly linear-attenuate; leaves low or saliently dentate.....
4. *H. algida.*
Leaves round-obovate to spatulate; mostly middle altitudes.
Rays 1½ to 5 (or 7) lines long; flowering plants mostly with white-woolly leaves.
5. *H. vestita.*
Rays 6 to 8 lines long; flowering plants mostly with green leaves. 6. *H. californica.*

1. **H. brevifòlia** Gray. Stems slender, several from the crown of a perennial taproot, 1 to 1½ ft. high, the stem or simple branches ending in a single head; leaves spatulate-oblong to linear, denticulate, 1 to 1¾ in. long; heads smaller than in H. heterochroma; involucre 5 lines high, its bracts linear, acute, rather loose; rays 10 to 17, light yellow, 4 to 5 lines long; paleae of the pappus merely erose. — Montane, about 7500 ft., Mariposa Co.: Clouds Rest; Snow Creek; Indian Cañon; Buck Camp.

993. Hulsea heterochroma Gray: *a*, part of fl. stem x ½; *b*, ray-fl. x 2; *c*, disk-fl. x 2.

2. **H. héterochròma** Gray. Fig. 993. Robust branching annual 1½ to 3 ft. high; herbage very viscid-villous with a rank odor; leaves narrowly elliptic to oblong, saliently dentate, 2 to 3 (or 5) in. long; heads corymbosely or racemosely disposed; involucral bracts lanceolate, attenuate, 6 to 7 lines long; rays 50 to 70, narrowly linear, purple, 2½ to 3 lines long; disk-corollas yellow, their tubes hirsute; achenes with straight spreading hairs; pappus-paleae 4, in 2 unequal pairs, lacerate. — Montane, 3000 to 8000 ft.: San Jacinto, San Bernardino and San Gabriel mountains; Santa Lucia Mts.; sw. San Benito Co.; Sierra Nevada from Tulare Co. to Mariposa Co.

3. **H. nàna** Gray. Stems 2 to 7 in. high, one to several from the crown of a stout perennial root, simple, stoutish, terminated by a single rather large head; herbage viscid-pubescent, the cottony wool early deciduous; leaves narrow to broadly linear, irregularly crinkled or dentate or pinnately sinuate, 1 to 3 (or 4) in. long, mostly basal, those of the stem few and smaller; involucre sparingly tomentose, viscid, 6 lines high, its bracts narrowly oblong, acute; rays numerous, yellow, linear, 4 to 5 lines long; pappus-paleae equal or unequal, fimbriate.—Loose volcanic rocks, peaks of n. Cal., 8000 to 11,000 ft.: Lassen Peak; Mt. Shasta; Mt. Eddy; n. to Cascade Mts. of Ore. and Wash. (Var. larsenii Gray.)

4. **H. álgida** Gray. Similar to H. nana; leaves low or sometimes saliently dentate; heads somewhat larger; involucres loosely woolly, the wool more persistent; bracts linear-attenuate.—High peaks, 11,000 to 14,000 ft.: Sierra Nevada from Mt. Whitney to Mt. Rose; White Mts.; n. to eastern Ore.

5. **H. vestita** Gray. Stems scape-like and one-headed, 4 to 12 in. high, arising from a perennial root and a rosette of white-tomentose leaves; leaves roundish (or sometimes oblong) -spatulate, entire or sinuate-dentate, drawn down below to a long winged petiole, 1 to 1½ in. long; stems and involucres viscid-pubescent; bracts of the involucres linear-lanceolate, acute, 5 to 6

lines long; rays yellow 3 to 4 (1½ to 7) lines long, sometimes very short or none; pappus-paleae about 4, silvery, quadratish, lacerate.—Loose gravelly or sandy soil, higher crests and slopes of ranges bordering the deserts, 6000 to 9500 ft.: Sierra Nevada from Madera Co. to Kern Co.; Frazier Mt.; San Bernardino Mts.; also in sw. Nev. Var. PYGMAÈA Gray. Subalpine or alpine dwarf; heads on short peduncles or even subsessile in the tuft of basal leaves; rays deep dull yellow.—High peaks, 8000 to 11,000 ft.: San Bernardino Mts.; s. Sierra Nevada in Tulare Co. Var. CALLICÁRPHA Hall. El Caparossa. Biennial or perennial; stems branching from near the base or at the middle, ¾ to 3 ft. high; leaves basal and along the stems, 1½ to 4½ in. long; rays yellow, sometimes with purplish base.—Open or pine-covered slopes, 4000 to 6000 ft.: San Gabriel, San Jacinto, Palomar and Cuyamaca mountains.

6. **H. califórnica** Gray. Robust branching biennial; stems leafy throughout, 2 to 3 ft. high; leaves ample, oblong-spatulate, irregularly dentate or sinuate, 3 to 5½ in. long, the uppermost ovate to lanceolate, smaller; heads racemose or corymbose towards the ends of the branches, rather short-peduncled; bracts of the involucre lanceolate; rays many, 6 to 8 lines long; pappus-paleae oblong-quadratish, erose, in somewhat unequal pairs or sometimes equal.—S. San Diego Co. (Campo); s. to L. Cal.

126. **VENEGÀSIA** DC.

Perennial herb with tall leafy stems. Leaves alternate, petioled, ovate, cordate or truncate at base. Heads large, radiate, few in the upper axils and terminal, short-peduncled. Involucre of 2 or 3 series of broadly oval mostly membranous bracts, the outermost loose and herbaceous, the innermost broader and membranous. Receptacle flat. Corolla-tube densely glandular-bearded at base. Rays numerous, showy, yellow. Achenes many-nerved. Pappus none. (Michael Venegas, Jesuit missionary.)

1. **V. carpèsioìdes** DC. Stem erect, sparingly branched, 3 to 8 ft. high, with the aspect of Helianthus; herbage glabrous, or minutely pubescent above; leaves thin, serrate or subentire, 2 to 6 in. long, on petioles about ⅓ as long; rays 13 to 20, about ½ to 1 in. long, entire and acute, sometimes toothed or irregularly lacerate at tip; achenes about 12-nerved, papillose-roughened.—Coastal region from Santa Barbara Co. to w. Riverside Co. and to San Diego Co.

127. **JAÚMEA** Pers.

Perennial glabrous herbs. Leaves linear, entire, fleshy, opposite and connate at base. Heads middle-sized, many-flowered, solitary, terminating the branches, radiate. Flowers yellow, all fertile, the rays pistillate. Involucre cylindraceous-campanulate, its bracts broad and imbricated, the outermost short and fleshy. Receptacle conical. Corolla glabrous. Style-branches of the disk-flowers thickened upward and papillose. Achenes linear, striately 10-nerved. Pappus (in ours) none. (I. H. Jaume St. Hilaire, French botanist.)

1. **J. carnòsa** Gray. Stems simple, erect, 4 to 6 in. high, arising from the root-crown, or the second year with the lower portion persistent and prostrate, rooting at the nodes on the under side, and sending up erect stems above; leaves thick, ¾ to 1½ in. long; heads 6 to 7 lines high; rays 9 to 12, 1½ lines long.—Salt marshes and beaches along the California coast; n. to B. C. June-Oct.

128. **HELÈNIUM** L. SNEEZEWEED

Erect perennial herbs with resinous-dotted herbage. Leaves alternate, sessile except the lower, and often decurrent on the stem. Heads solitary or corymbose, borne on long naked peduncles. Flowers golden-yellow, or the disk-corollas turning yellowish or brown. Rays several to many, usually drooping or deflexed. Bracts of the involucre linear, reflexed. Receptacle globose or hemispherical. Achenes turbinate, ribbed. Pappus of 5 to 12 thin or hyaline paleae, in ours short-pointed. (Greek name of some plant, perhaps named after Helenus, son of Priam.)

Leaves not decurrent on the stem; rays relatively narrow, spreading; bracts of the involucre tardily reflexed ..... 1. *H. hoopesii.*
Leaves decurrent on the stem; rays very broad, deflexed; bracts of the involucre reflexed.
Rays shorter than the disk, 3 to 5 lines long..... 2. *H. puberulum.*
Rays as long or longer than the disk, 7 to 9 lines long.
Disk subglobose; pappus about half as long as the disk-corolla..... 3. *H. bigelovii.*
Disk broader than high; pappus nearly as long as the disk-corolla. 4. *H. bolanderi.*

1. **H. hóopesii** Gray. Stem stout, 1¼ to 3 ft. high, leafy, bearing 3 to 13 large heads; herbage tomentulose or soon glabrate; leaves thickish, entire, oblong-oblanceolate, somewhat nervose, 5 to 10 in. long, the basal with long tapering base, ½ to 1½ ft. long; disk hemispherical, ½ to ¾ in. high; rays 14 to 19, showy, 8 to 10 lines long, tardily reflexed; paleae of the pappus ovate-lanceolate, attenuate-acuminate, ¾ as long as the corolla; achenes densely tawny-hairy.—High montane, 6300 to 9500 ft.: Sierra Nevada from Tulare Co. to Tuolumne Co.; Warner Range; n. to Ore., e. to the Rocky Mts. The herbage is markedly poisonous to sheep, less so to cattle.

994. Helenium puberulum DC.; *a*, fl. branchlet x ¼; *b*, leaves x ¼; *c*, head x 1; *d*, *e*, ray-flls. x 5; *f*, achene and pappus x 10.

2. **H. pubérulum** DC. Rosilla. Fig. 994. Stem erect, paniculately branched, 2 to 5 ft. high, the branches ending in long slender peduncles; herbage puberulent; leaves lanceolate or narrowly linear or the longest oblong, sessile and strongly decurrent on the stem; globose disk of flowers 5 to 7 lines broad; rays and bracts of the involucre reflexed, short and inconspicuous; disk-flowers red-brown; scales of pappus ovate, short-awned. — Creek beds, stream banks and about springy places, 5 to 2000 ft.: coastal S. Cal.; Coast Ranges; Sierra Nevada foothills in Butte Co.; s. to L. Cal. July-Nov.

3. **H. bigelòvii** Gray. Bigelow Sneezeweed. Stem 2 to 4 ft. high, branching above into several erect peduncle-like branches, rarely simple; leaves lanceolate to broadly oblong-lanceolate or linear, thickish, 4 to 10 in. long, glabrous or minutely tomentose, not so conspicuously decurrent as in H. puberulum; rays showy, 7 to 9 lines long; disk brown or brownish yellow; pappus-paleae 5 to 8, ovate-lanceolate, tapering into a slender awn; achene sparingly hairy. — Marshy or springy ground: San Jacinto and San Bernardino mountains and Sierra Nevada, 3500 to 7500 ft.; North Coast Ranges, 5 to 3500 ft.; e. to Ariz., n. to southwestern Ore. Var. festìvum Jepson n. var. Upper leaves sessile and decurrent, often broader than the basal (sometimes 2 in. broad); heads 1½ to 2½ in. broad; rays 20 to 30, very broadly cuneate, 1 in. long, 4 to 6 lines wide, 3 (4 or 2)-lobed at apex, rather densely short hairy on the under side; pappus-paleae about 6 to 9, awn-tipped; achenes of the 2 or 3 outer rows somewhat obovate, rather broader than the oblong central ones.—Humboldt Bay (J. P. Tracy 1204, type).

4. **H. bolánderi** Gray. Stems stout, often simple, 1½ to 2 ft. high, somewhat flocculent-pilose; leaves oblanceolate to ovate-lanceolate; peduncles thick, a little enlarged upwardly; disk 10 to 13 lines broad, decidedly broader than high; rays 9 to 12 lines long; paleae of pappus lanceolate or subulate, with a slender bristle almost equaling the disk-corolla.—Boggy places along the seacoast, Mendocino and Humboldt Cos.: Ft. Bragg; Cleone; Shelter Cove.

129. **ACTINÉLLA** Nutt.

Perennial herbs. Leaves thickly punctate, in basal tufts or alternate. Heads radiate, commonly solitary on scape-like peduncles. Bracts of the involucre many, nearly equal, in 2 or 3 series. Receptacle low-conical. Rays inclined to persist and turn pale. Achenes silky-villous. Pappus of 5 to 7 hyaline paleae. (Diminutive of Actinea, from Greek aktis, ray.)

1. **A. acáulis** Nutt. Stems naked, scape-like, 3 to 6 in. high, the leaves in dense basal tufts, both stems and leaves borne on the short stout branches of the root-crown; herbage white-villous, the long hairs mostly deciduous except at base; leaves linear-oblanceolate or spatulate, entire, drawn down to a narrow base, ½ to 2 in. long; heads 3 to 5 lines high; involucres hemispheric, their bracts oblong, obtuse; rays yellow, 3 to 5 lines long, 3 to 4 lines wide, 3-toothed at apex; paleae oblong to quadratish, bristle-tipped.—Desert mesas, 4000 to 8000 ft.: e. Mohave Desert (New York Mts.); Nev. to N. Mex. and Mont. May.

130. **PSILÓSTROPHE** DC.

Herbs or low shrubs. Leaves narrow, alternate. Heads conspicuously radiate, solitary or cymose, the flowers all fertile. Ray-flowers 3 to 8, the rays yellow, persistent and becoming papery. Disk-flowers 5 to 12, their corollas with short proper tube. Style-branches truncate-capitate. Achenes narrow, terete, obscurely striate or angled. Pappus of 4 to 6 hyaline paleae. (Greek psilos, bare, and strophe, to turn.)

1. **P. cóoperi** (Gray) Greene. Low shrub 1 to 1⅔ ft. high, the stems and branches densely white-lanate, the leaves whitish-tomentulose, more or less glabrate and green in age; leaves linear to narrowly spatulate, entire, ½ to 2 in. long; involucre 2¼ to 3 lines, its bracts 15 to 30, the inner ones soft, the outer ones rigid, oblong; rays 4 to 8, quadratish or broadly oval, 6 to 9 lines long, 4 to 6 lines wide, 3-toothed at the broad apex; pappus-paleae oblong or lanceolate, entire or erose-laciniate, shorter than the achene.—Desert mesas: e. Mohave Desert (Providence Mts. and Leastalk); Chuckawalla Bench, Colorado Desert; e. to Ariz. and southern Nev., s. to L. Cal. (Riddellia cooperi Gray.)

131. **BÁILEYA** Harv. & Gray

Densely floccose-woolly desert herbs. Leaves alternate, pinnatifid or entire. Heads solitary, radiate, peduncled. Involucre hemispherical, of many distinct linear bracts very woolly on the back. Ray-flowers pistillate, the rays persistent, bright yellow and showy when young, becoming papery and reflexed in age. Disk-flowers perfect and fertile, the corolla-teeth with a dense short beard on the back. Achene oblong-linear or clavate, truncate at the obscurely toothed apex, glabrous, strongly many-nerved, muriculate on the nerves. Pappus none. (J. W. Bailey of West Point, early American microscopist.)

Rays 5 to 8; peduncles mostly ¼ to 1 in. long.....1. *B. pauciradiata.*
Rays 25 to 50; peduncles mostly 3 to 10 in. long.....2. *B. multiradiata.*

1. **B. pauciradiàta** Harv. & Gray. Perennial but flowering the first year; stems erect, freely branching, leafy, ¾ to 1½ ft. high; herbage white with a loose or pilose tomentum; leaves bipinnatifid with remote lobes, the upper leaves (or sometimes nearly all) linear and entire; heads ½ to ¾ in. broad; bracts strongly 3-nerved; rays roundish-oval, 3 to 4 lines long.—Sandy soil in the deserts, common: Mohave and Colorado deserts; e. to Ariz. Apr.-May.

2. **B. multiradiàta** Harv. & Gray. Annual or perennial, 6 to 18 in. high; stems several to numerous from the base, simple, erect or nearly so, leafy mostly at base, soon passing into elongated naked one-headed peduncles; herbage appressed white-woolly; leaves pinnatifid with mostly close-set lobes, the upper few-toothed or entire; heads 1 to 1¾ in. broad; involucral bracts weakly 3-nerved; rays oblong to quadrate, truncatish at apex, 4 to 6 lines long.—Loose or sandy soil, e. Mohave Desert: New York Mts.; Leastalk; e. to Tex., s. to Mex. Var. PLENIRADIÀTA Cov. Stems several to numerous from the base, branching and leafy nearly throughout; peduncles mostly

very much shorter and more or less leafy below; heads smaller (about ¾ in. broad); rays clear lemon-yellow.—Inyo Co.; e. Mohave Desert; ne. Colorado Desert; e. to Ariz. and N. Mex., s. to L. Cal.

132. **WHÍTNEYA** Gray

Perennial herbs. Stems from filiform rootstocks, bearing 2 to 4 pairs of opposite leaves. Leaves mostly on lower part of stem. Heads radiate, on long peduncles in a 3 (or 5)-flowered cyme or solitary. Involucre campanulate, its bracts 9 to 12, oblong or lanceolate, nearly in a single series. Receptacle narrow-conical, rather densely hairy. Flowers yellow. Ray-flowers 7 to 9, fertile, the rays 10 to 16-nerved, persistent and becoming thin-chartaceous. Disk-flowers sterile, the corollas persistent. Fertile (or ray) achenes oblong, slightly obcompressed, hirsutulose. Pappus none. (J. D. Whitney, Director of the California Geological Survey, 1860 to 1870.)

1. **W. dealbàta** Gray. Plant with the aspect of Arnica; stems erect, one or few from the root-crown, 8 to 16 in. high; herbage whitish or pale with a minute close canescence; leaves ovate to oblong-lanceolate or -oblanceolate, obtuse, mucronate, entire, 1½ to 4 in. long, gradually attenuate into petioles ¾ to 2 in. long, the lower petioles somewhat connate at base; upper leaves small, lanceolate or linear; heads 5 to 7 lines high; rays 9 to 11 lines long.—Montane, 5000 to 7000 ft., Sierra Nevada, rare: Millwood, Fresno Co.; Cherry Creek, Tuolumne Co.; Pole Creek, Truckee River; Jonesville, n. Butte Co.; Eagle Lake, Lassen Co.

133. **POROPHÝLLUM** Vaill.

Perennial herbs. Herbage very glabrous, the involucres and rarely the leaves dotted with oil-glands. Leaves alternate, narrowly linear, entire. Heads in open cymes or solitary, narrow, discoid. Involucre of 5 equal broadly linear bracts, naked at base. Style appendages subulate. Achenes black, rusty-pubescent. Pappus of numerous capillary bristles. (Greek poros, a passage, and phullon, leaf, the involucral leaves with translucent oil-glands.)

1. **P. grácile** Benth. Plants 1½ to 2½ ft. high, the branched woody base bearing numerous erect branches, these slender and sparingly leafy and somewhat rush-like; herbage ill-scented; leaves filiform or linear, entire, ½ to 1½ in. long; heads cylindric, 7 to 9 lines high; involucral bracts hyaline-margined; flowers dull white or purple.—Arid plains and hillsides: Riverside; El Cajon; Needles; Ariz. to Nev., Tex. and Mex.

995. Nicolletia occidentalis Gray; *a*, fl. branchlet x ½; *b*, pappus-palea x 3½; *c*, ray-fl. x 2; *d*, disk-fl. x 2; *e*, pappus-bristle x 3½.

134. **NICOLLÈTIA** Gray

Perennial herbs with very glabrous and somewhat succulent herbage. Leaves alternate, pinnately parted. Heads large, radiate, the rays purplish or pinkish, the disk-corollas yellow, aging pink. Involucre short-oblong, its bracts 8 to 12, oblong, abruptly acute, all equal or often with 2 or 3 very short outer ones, all dotted with a few conspicuous oil-glands. Achenes narrowly clavate, rusty-pubescent. Pappus double, the outer of many capillary bristles, the inner of 5 thin lanceolate paleae tipped with a scabrous awn. (J. N. Nicollet, early American astronomer and explorer).

1. **N. occidentàlis** Gray. Fig. 995. Stems several from the deep-seated crown of a taproot, ½ to 2 ft. high, corymbosely branched at summit, leafy up to the heads; herbage with a heavy sickening odor; leaves ½ to 1¾ in. long, with short linear pungent lobes; heads 6 to 8 lines high; principal bracts of the involucre with a broad and a narrow one alternating; rays 8, pink-purple, striped with pink on the back, 2 to 3 lines long.—Deep sandy soil or sandy washes, Mohave Desert.

135. **DYSÒDIA** Cav.

Ours strong-scented perennial herbs with conspicuously striate stems. Herbage glabrous or scaberulous, the involucre and leaves blotched with conspicuous oil-glands. Heads rather large, solitary, terminating naked peduncles. Flowers yellow; rays present or none. Involucre with an inner series of strongly ridged nearly or quite distinct bracts and an outer or accessory series of much shorter calyculate ones. Achenes striate, glabrous. Pappus-paleae 10 or 12, each deeply divided into 4 to 6 very unequal slender bristles. (Greek dysodia, a disagreeable smell.)

Heads about 1 in. broad; rays 3 to 5 lines long.....1. *D. cooperi.*
Heads about ½ in. broad; rays few and inconspicuous, 1 line long....2. *D. porophylloides.*

1. **D. cóoperi** Gray. Stems many from the branching woody crown of a thick root, 11 to 14 in. high; herbage scaberulous; leaves alternate, obovate to oblong, spinulose-dentate, 5 to 10 lines long, the apex often provided with an oil-gland, the base commonly with a pair; peduncles dilated upwards; bracts with 1 to 3 oblong oil-glands, a conspicuous one just below the abruptly subulate-acuminate tip; rays 12 to 16, 3 to 5 lines long; pappus 3 to 4 lines long.—Dry ravines, Mohave and Colorado deserts; e. to Ariz.

2. **D. porophýlloides** Gray. Habit of no. 1; leaves alternate or some of the lower opposite, lower leaves pinnately 3 to 5-parted into linear or oblong cuspidate lobes, the tips of the lobes blotched with an oblong oil-gland, the basal part of the leaf usually with a pair; involucral bracts acute, mostly with a series of linear or oblong glands on each margin above the middle; pappus 4 to 5 lines long.—Colorado Desert and n. to the southern part of the Mohave Desert at Dale; e. to Ariz. Herbage glabrous.

136. **PÉCTIS** L.

Low herbs with glabrous herbage. Leaves narrow, opposite, bearing large elliptic glandular dots, hence often aromatic. Heads small, radiate (in ours), cymose or solitary. Flowers yellow. Involucre cylindric or campanulate, its equal narrow bracts in a single series, strongly carinate and partially embracing the ray-achenes. Style hispidulous. Achenes slender, striate, fertile in both disk and ray. Pappus of bristles, awns or paleae, or sometimes none. (Greek pecteo, to comb, the leaves in some species, regularly setiferous.)

1. **P. pappòsa** Gray. CHINCH-WEED. Fig. 996. Low annual, divergently much branched from the base, the branches 2 to 4 (or 8) in. long; herbage with a strong disagreeable odor; leaves narrowly linear, ¾ to 1¼ in. long, about ½ line wide, entire, bearing at base 1 to 5 pairs of bristles; heads 3 lines high, on short peduncles in cymose clusters or

996. Pectis papposa Gray; *a*, leaf x 1½; *b*, habit x ¼; *c*, head x 1½; *d*, ray-fl. x 3; *e*, disk-fl. x 3.

sometimes solitary; bracts with a callous foot; rays yellow, 1¼ to 2 lines long; achenes scantily rusty-pubescent; ray-pappus a mere crown, rarely with 1 or 2 awns; disk-pappus of 12 to 20 barbellate or almost plumose bristles, or sometimes none.—Sandy soil, 50 to 4000 ft.: Colorado Desert and n. to the Panamint Range; e. to Utah, s. to Mex.

Tribe 10. **Anthemideae.** Mayweed Tribe

Strong-scented or aromatic plants. Leaves alternate, all or some of them finely dissected, pinnately parted or pinnatifid, except in no. 142. Bracts of the involucre imbricated, commonly dry and scarious or with scarious margins. Receptacle naked or with chaff-like bracts. Flowers white, yellow or greenish. Rays present or none. Anthers not caudate. Pappus none or a short scarious crown.

137. **ÁNTHEMIS** L. Chamomile

Branching herbs. Leaves alternate, finely and pinnately dissected. Heads solitary on terminal peduncles, ¾ to 1 in. broad. Ray-flowers white, pistillate, the spreading rays at length reflexed; disk-flowers yellow. Involucre hemispherical, its bracts scarious and at length dry, imbricated in several series. Receptacle conical, with chaff-like bracts toward the summit. Achenes angled or striate, not hairy. Pappus none. (Ancient Greek name of the Chamomile.)

997. Anthemis cotula L.; *a*, fl. branchlet x ½; *b*, disk-fl. x 5; *c*, bract of receptacle x 5; *d*, receptacle x 2½; *e*, achene x 6.

1. **A. cótula** L. Mayweed. Fig. 997. Annual, 1 to 2 or rarely 3 ft. high; herbage ill-scented, nearly glabrous; bracts narrow and acute, or awl-like; ray-flowers 14 to 20, sterile; achenes rugose, 10-ribbed.—Nat. from Eur.; abundant in pastures and waste lands. May-Aug. Also called Dog Fennel.

A. nóbilis L. Garden Chamomile. Perennial; peduncles erect from decumbent branches, 4 to 8 in. high; herbage pubescent, aromatic; achenes smooth, with a narrow membranous border.—Garden plant from Eur.; an escape at Ft. Bragg.

138. **ACHILLÈA** L. Yarrow

Perennial herbs with alternate leaves, in ours pinnately divided into many fine segments. Heads in a terminal corymb, radiate; rays few, white; disk-flowers yellow; both disk and ray fertile. Involucre oblong or ovoid, its bracts imbricated, with scarious margins. Receptacle chaffy, nearly flat. Achenes strongly obcompressed, callous-margined, destitute of pappus. (In honor of Achilles.)

Rays white, ⅓ to ½ as long as the involucre; bracts of the involucre pale, rarely brown-margined; leaves villous ..... 1. *A. millefolium.*
Rays white or pink, ½ to ⅔ as long as involucre; bracts of the involucre dark brown-margined; leaves silky-pubescent ..... 2. *A. borealis.*

1. **A. millefólium** L. var. **lanulòsa** Piper. Common Yarrow. Milfoil. Fig. 998. Stem simple, erect or ascending at the very base, 1¼ to 3 ft. high; herbage loosely villous or a little arachnoid, sometimes shaggy-villous; leaves linear-lanceolate in outline, the multifid divisions crowded on the rachis, the ultimate segments linear; corymb compound, flat-topped or convex; rays 4 or 5; achenes rather broadly margined.—Open slopes or open woodlands, low

hills to high mts., 200 to 9000 ft.: throughout Cal.; n. to Wash., e. to Mich. Mar.-July. (A. lanulosa Nutt.) Var. MARÍTIMA Jepson n. var. Stem densely leafy; herbage villous-pubescent; ultimate leaf-segments narrowly ovate; corymb flat-topped.—Seabeaches, San Francisco Bay (West Berkeley, Jepson, type). Var. CALIFÓRNICA Jepson n. comb. Stem sparsely pubescent; leaves green, glabrate; leaf-segments spinulose-tipped; achenes narrowly margined.—Coastal S. Cal. (A. californica Pollard.)

2. **A. boreàlis** Bong. Alpine dwarf 4 to 7 in. high; bracts of the involucre somewhat scarious, with red-brown margins; achenes slender, winged.—High montane, 8500 to 11,000 ft., rare in Cal.: Mariposa Co.; Silver Mt., Alpine Co.; Mt. Shasta; n. to Alas. and Can., e. to Rocky Mts.

998. Achillea millefolium var. lanulosa Piper; *a*, fl. branchlet x 1; *b*, leaf x 1; *c*, disk-fl. x 3; *d*, ray-fl. x 3.

139. CHRYSÁNTHEMUM L.

Annual or perennial herbs, ours with toothed or incised leaves. Heads large, solitary on leafy-bracted peduncles. Disk-flowers yellow; rays yellow or white. Receptacle flat or hemispherical, naked. Achenes glabrous, at least those of the disk 5 to 10-ribbed all around. (Greek chrusos, gold, and anthemon, a flower.)

Lower leaves mostly clasping; bracts ovate; rays deep yellow, with broad base, conspicuously notched at apex, 2 to 4 lines wide.....1. *C. segetum.*
Lower leaves petioled; bracts lanceolate; rays white, with tapering base, inconspicuously notched at apex, 1 to 3 lines wide.....2. *C. leucanthemum.*

1. **C. ségetum** L. CORN CHRYSANTHEMUM. Annual, erect, 1 to 2 ft. high; herbage glabrous; lower leaves pinnatifid or incised; upper merely denticulate, sessile by a clasping base; heads 1¼ to 2 in. wide; ray-achenes broad, 3-sided, lateral angles winged and few-toothed; disk-achenes cylindric.—Open fields, nat. from Eur.: West Berkeley; Caspar; Mendocino City. May-June.

2. **C. leucánthemum** L. OX-EYE DAISY. Perennial; stem erect, simple or branched above, 1 to 3 ft. high; herbage essentially glabrous; lower leaves obovate or spatulate, tapering to a long petiole, coarsely toothed; cauline leaves oblanceolate, clasping, ½ to 2½ in. long, dentate; bracts lanceolate, edged with a brown line and scarious-margined; heads 1¼ to 2 in. wide; rays white.—Fields, nat. from Eur.: Eureka; Sisson; Crescent City. Aug.-Sept.

140. TANACÈTUM L.

Strong-scented perennial herbs. Leaves entire, somewhat cleft or 2 or 3 times pinnately divided into numerous small lobes. Heads globular, discoid, many-flowered, borne in a corymb-like peduncled cluster or in a cyme. Flowers yellow. Involucre of numerous scale-like bracts. Receptacle flat or low, naked. Achenes 5-ribbed or 3 to 5-angular, with broad truncate summit bearing a low crown-like pappus or none. (Name obscure.)

Heads flat, low-convex, ½ in. broad; pappus coroniform-dentate; receptacle flat.....1. *T. camphoratum.*
Heads globular, smaller; pappus obsolete or none; receptacle convex or conical.

Herbaceous; leaves dissected; heads 3 to 4 lines in diameter; receptacle densely fimbrillate-hirsute ..... 2. *T. potentilloides.*
Suffrutescent at base; leaves simply or pedately cleft or entire; receptacle not hirsute. 3. *T. canum.*

1. **T. camphorâtum** Less. DUNE TANSY. Fig. 999. Stems robust, decumbent or ascending, 1 to 2½ ft. long; herbage with the aroma of camphor, villous-tomentose when young, the wool more or less deciduous in age; primary and secondary divisions of leaves much crowded, the latter oval or oblong, the margin more or less revolute; achenes glandular.—Sand-dunes along the coast: San Francisco to Humboldt Bay. Aug.-Nov.

999. Tanacetum camphoratum Less.; *a*, fl. branchlet x ½; *b*, pinna x 2; *c*, pinnule x 4; *d*, fl. x 4.

2. **T. potentílloides** Gray. Stems erect or decumbent, several from a thick or shortly branched root-crown, 4 to 6 in. high; herbage villous, grayish; leaves mostly in a basal tuft, ovate in outline, 2 to 3 times pinnately dissected into linear lobes, ½ to 1 in. long, with a petiole as long or longer; upper leaves clasping, similar but reduced; corymbs very compact, with 2 to 5 heads; heads hemispheric, 2 to 3 lines broad; bracts of the involucre very short-ovate or round-ovate, villous, with scarious margins; disk-flowers golden yellow.—Easterly valleys of the higher Sierra Nevada in Sierra, Nevada and Eldorado Cos.; e. to Nev., n. to southeastern Ore.

3. **T. cánum** Eat. Stems erect, leafy, several from the somewhat branched and woody root-crown, 3 to 5 in. high; herbage canescent with a close tomentum; leaves linear, simple or divided to the middle into 3 (or 4) linear lobes, 3 to 5 (or 8) lines long, sessile; corymbs compact, with 2 to 5 heads; heads 1½ to 3 lines wide, with rounded base; bracts of the involucre ovate, canescent, scarious-margined; disk-flowers lemon-yellow.—High montane cliffs and rocky slopes, 8000 to 11,000 ft.: Sierra Nevada from Mt. Dana to Mt. Whitney and Olancha Peak; e. to Nev., n. to southeastern Ore.

141. MATRICÀRIA L.

Ours glabrous annuals with pinnately dissected leaves. Heads solitary or somewhat corymbose, with many greenish yellow flowers. Receptacle slender-conical, naked. Bracts of the involucre imbricated, with scarious margins, persistent. Corollas tubular, without limb. Rays none. Pappus reduced to a membranous crown or border, or none. Achenes glabrous, 3 to 5-nerved on the sides, rounded on the back. (Latin matrix, because used medicinally.)

Heads 2 to 4 lines high; achenes with an obscure margin at summit ..... 1. *M. suaveolens.*
Heads mostly 4 to 6 lines high; achenes with a broad or unequally lobed crown ..... 2. *M. occidentalis.*

1. **M. suavèolens** (Pursh) Buch. PINEAPPLE WEED. Fig. 1000. Stem branching, 2 to 10 in. high; herbage sweet-scented; heads short-peduncled, 2 to 3 (or 4) lines high; bracts of the involucre broadly ob-

1000. Matricaria suaveolens Buch.; *a*, habit x 1; *b*, long. sect. of head x 1½; *c*, fl. x 5.

long.—Common in beaten roadways, about old farm buildings and in pasture lands throughout Cal. Apr.-May. Doubtfully native. (M. discoidea DC. M. matricarioides Porter.)

2. **M. occidentàlis** Greene. Stem either branching or unbranched below the corymbose summit, 1½ to 2 ft. high; herbage not so strongly scented; heads as much as ½ in. high; achenes sharply angled, with a broad crown-like margin, or the crown lobed and 1-sided.—Rich soil of fields: Sacramento Valley and South Coast Ranges to coastal S. Cal.

142. **ARTEMÍSIA** L. Sagebrush

Herbs and evergreen shrubs, mostly bitter and aromatic, with alternate leaves. Heads small, nodding or erect, in panicled spikes or racemes. Flowers yellow or purplish; rays none. Disk-flowers perfect and marginal ones pistillate, or all perfect. Corollas of the pistillate flowers 2 or 3-toothed, of the perfect flowers 5-toothed. Involucre imbricated, dry and scarious. Receptacle nearly flat, naked (or chaffy in one species). Achenes obovoid or oblong, mostly with a small terminal disk or areola. Pappus none. (Artemisia, wife of Mausolus, king of Caria.)

A. Heads consisting wholly of perfect fertile flowers.

Plants wholly or nearly herbaceous, the stems and upper surface of leaves green or greenish; receptacle chaffy, most of the flowers being subtended by scale-like bracts..... 1. *A. palmeri.*

Shrubs or shrubby, the herbage canescent or silvery with fine close tomentum; receptacle naked.

Heads comparatively small (1 to 2 lines long), 5 to 9-flowered; bracts rather firm.

Plants 3 to 6 ft. high; leaves mostly 3-toothed or the upper entire..... 2. *A. tridentata.*

Plants ¾ to 2 ft. high.

Leaves deeply lobed or cleft or some entire.

Heads few; leaves 3-lobed.....3. *A. arbuscula.*

Heads numerous; leaves 3 to 5-lobed.....4. *A. trifida.*

Leaves entire, rarely toothed.....5. *A. cana.*

Heads larger and broader, 7 to 14-flowered; inner bracts more nearly scarious.

Pubescence minute and very close; bracts of involucre broad....6. *A. rothrockii.*

Pubescence looser; inner bracts of involucre narrow.....7. *A. bolanderi.*

B. Heads with the marginal flowers pistillate, the central ones perfect.

Flowers all fertile; style 2-cleft.

Shrub; achenes with a minute squamellate crown-shaped pappus at the summit..... 8. *A. californica.*

Herbs (or slightly woody at base); achenes wholly destitute of pappus.

Biennial; wholly glabrous.....9. *A. biennis.*

Perennial; more or less hairy.

Leaves without white-cottony tomentum.....10. *A. norvegica.*

Leaves white-cottony beneath, green or glabrate above.....11. *A. vulgaris.*

Only the marginal pistillate flowers fertile, the central perfect ones infertile; style mostly entire.

Achenes and flowers beset with long cobwebby and crisped hairs; leaves 2 to 3 times pedately dissected; spinescent dwarf shrub .....12. *A. spinescens.*

Achenes nearly glabrous; perennial (or biennial) herbs, not spinescent.

Leaves dissected into spatulate or linear lobes, densely silky-villous..... 13. *A. pycnocephala.*

Leaves mostly entire; herbage glabrous.....14. *A. dracunculus.*

1. **A. pálmeri** Gray. Stems slender, erect, herbaceous or a little woody at base, 2 to 3 ft. high, minutely pubescent; leaves pinnately divided into 3 or 5 remote linear lobes or some linear and entire, 1½ to 2½ in. long, almost glabrous above, white-pubescent beneath, the margins revolute; heads mostly erect, sometimes nodding in age, rather densely disposed on the branches of the elongated panicle; involucres hemispheric, 1 to 1½ lines high; bracts of the receptacle scarious, subtending many of the flowers.—Sw. San Diego Co.: San Diego; National City; Jamul Valley; s. to L. Cal.

2. **A. tridentàta** Nutt. Common Sagebrush. Fig. 1001. Erect much-branched shrub 3 to 6 ft. high, with a distinct trunk and shreddy bark; herbage aromatic, canescent or silvery throughout with a fine and close tomentum; leaves narrowly cuneate or oblanceolate, 3 (or 4)-toothed at apex or entire, ¾ to 1¾ in. long; panicle diffuse (or sometimes narrow), ½ to 1½ ft. long; heads narrow, 4 to 6-flowered, 1½ to 2 lines high; accessory bracts short, broadly ovate.—High plains and arid mountain slopes, 1500

1001. Artemisia tridentata Nutt.; *a*, fl. branchlet x ⅓; *b*, head x 3; *c*, bract of involucre x 5; *d*, fl. x 5.

to 6000 ft., exceedingly abundant in the main parts of its range: Siskiyou Co. to Modoc Co., thence s. along e. side of Sierra Nevada to Inyo Co.; w. slope Sierra Nevada from Mariposa Co. to Kern Co.; Tehachapi Mts.; mts. on w. side Mohave Desert; desert slopes San Gabriel, San Bernardino, San Jacinto and Santa Rosa mountains; only occasional in coastal S. Cal.; e. to Col., n. to Mont. and B. C. Var. PARÍSHII Jepson n. comb. Bush 1 to 3 ft. high; herbage densely and closely cinereous-pubescent; leaves spatulate, strongly 1-nerved, mostly entire but some of the lower ones 2 or 3-toothed at apex, the margins revolute, ¾ to 1¼ in. long; heads oblong, 5 to 7-flowered, 1 to 1½ lines high, inclined to nod when mature, in small close glomerules on short branchlets of the rather loose oblong panicle; achenes cobwebby-villous. — Western margins of the Mohave Desert: Newhall; Rosamond; Santa Clara River; also w. Nev. (A. parishii Gray. A. tridentata subsp. parishii Hall.)

3. **A. arbúscula** Nutt. BLACK SAGE. Dwarf bush 7 to 13 in. high, the main branches stout, the flowering branches slender; leaves cuneate or fanshaped, 3-parted or -divided, the lobes spatulate to linear or oblong, sometimes again 2-lobed, 1½ to 3½ lines long, those subtending the heads usually entire and narrow; panicle naked, strict, or the inflorescence often simple and spike-like; heads sessile, 5 to 9-flowered.—High mts. and elevated arid plains, 5000 to 9000 ft.: Nevada and Eldorado Cos.; e. to Utah and Wyo., n. to Ida.

4. **A. trífida** Nutt. Much branched shrub ¾ to 2 ft. high; herbage silvery or canescent with a very fine close tomentum; leaves cuneate or fanshaped, 3-cleft at apex or 3-divided into linear lobes, 3 to 8 lines long; heads oblong or ovatish, 5 to 8-flowered, 1 to 2 lines long, borne in a narrow panicle or simple spike; involucres canescent, the accessory bracts oblong or lanceolate; achenes resinous-granuliferous.—Elevated open plains, rare in Cal.: Lancaster, Mohave Desert; e. Ore. to Mont. and Col.

5. **A. càna** Pursh. Shrub 1 to 3 ft. high; herbage mostly silky-canescent; leaves linear, acute, 1 to 2 in. long, entire or rarely with 1 or 2 irregular teeth or lobes; heads erect, 6 to 15-flowered, sessile in small glomerules, the glomerules disposed in a narrow leafy panicle; involucres campanulate.—Plains and low mts. of the arid interior: e. side Sierra Nevada from Mono Co. to Nevada Co.; n. to Can., e. to N. Mex. and Neb.

6. **A. rothróckii** Gray. Low erect shrub ½ to 1½ ft. high; stems whitened, the leaves canescent or some of them greenish; leaves spatulate, obtuse, entire or sometimes trifid at the dilated apex, 6 to 9 lines long; heads oval, 7 to 12-flowered, 2 to 3 lines long, in close glomerules, the glomerules disposed in spikes and subtended by reduced leaves; involucral bracts broadly or narrowly obovate; achenes nearly glabrous, glandular-granuliferous.—High plateaus, 7000 to 10,000 ft.: Sierra Nevada from Mt. Dana to Olancha Peak; San Bernardino Mts.; e. to Col., n. to Wash.

7. **A. bolánderi** Gray. Shrub 1 to 2 ft. high; leaves narrowly linear, 6 to 11 lines long, ½ to 1 line wide, entire and acutish, or some 3-cleft at apex; heads numerous, densely glomerate-paniculate, 14-flowered, mostly equaled or surpassed by 1 or 2 linear-subulate accessory bracts.—East slope of the Sierra Nevada in Mono Co., 7500 to 9000 ft.

8. **A. californica** Less. CALIFORNIA SAGEBRUSH. OLD MAN. Fig. 1002. Gray shrub 2½ to 4 ft. high; leaves with a minutely appressed pubescence, the lowest palmately once or twice parted into linear-filiform segments, the upper entire and more or less fascicled; heads many, nodding in long racemose panicles; involucres 1½ or 2 lines broad; achenes with a minute squamellate crown-shaped pappus. — Exposed slopes of hills, often gregarious, 10 to 2500 ft.: Marin Co., sw. Solano Co. and Mt. Diablo to coastal S. Cal.; w. side Colorado Desert; s. to L. Cal.

9. **A. biénnis** Willd. Erect virgate biennial herb 1 to 3 ft. high; herbage glabrous, inodorous, tasteless; leaves 2 to 4½ in. long, bipinnately divided into lanceolate or broadly linear incised or serrulate divisions, or the uppermost merely pinnatifid; heads crowded on the short branchlets, the whole inflorescence spike-like and more or less leafy; achenes with small epigynous disk. — Weed in river bottoms or borders of marshes, introduced from Eur.: lower Sacramento River; West Berkeley; Palo Alto; Laguna, Orange Co.

1002. Artemisia californica Less.; *a*, fl. branchlet x ½; *b*, leaf x ½; *c*, head x 3; *d*, staminate fl. x 7; *e*, pistillate fl. x 7.

10. **A. norvégica** Fries var. **saxátilis** Jepson n. comb. Stems rather stout, ½ to 2 ft. high, herbaceous; herbage thinly villous to glabrate; leaves ovate in outline, 3 to 5 in. long, twice pinnately parted into linear or lanceolate segments, the segments 2 to 10 lines long; heads large (commonly 4 to 5 lines broad), nodding, loosely racemose or racemose-paniculate, most of them long-peduncled; bracts of the involucre with broad scarious brown margins; corolla yellow or turning brown, loosely pilose, rarely almost glabrous.—High montane, 5000 to 9000 ft.: Sierra Nevada from Tulare Co. to Placer Co.; e. to Col., n. to Alb. and Alas.; Siberia. (A. norvegica subsp. saxatilis Hall. A. chamissoniana var. saxatilis Besser.)

1003. Artemisia vulgaris var. heterophylla Jepson; *a*, fl. branchlet x ½; *b*, leaf x ½; *c*, head x 3.

11. **A. vulgàris** L. var. **díscolor** Jepson n. comb. Stems erect, simple or branching, mostly slender, 10 to 15 in. high, from running rootstocks, glabrous or glabrate; leaves ovate in outline, 1 to 2 in. long, pinnately divided into 5 narrow segments, the segments entire or again toothed or cleft, green and glabrate above, white-tomentulose beneath; heads 1 or 2 lines high, 20 to 30-flowered, glomerate, the glomerules disposed in an interrupted spike-like or virgate panicle; involucres

hemispherical-campanulate, greenish and scarious, glabrous or glabrate, 20 to 30-flowered.—Sierra Nevada, both slopes, 4000 to 5000 ft., uncommon; n. to B. C., e. to Mont. and Col. (A. discolor Dougl. A. vulgaris subsp. discolor Hall.) Var. HETEROPHÝLLA Jepson n. comb. California Mugwort. Fig. 1003. Stems from running rootstocks, erect, woody at base, strict, 3 to 6 ft. high; leaves lanceolate to oblong, ovate or elliptic, sparingly pinnatifid (with downward incisions), cleft or often entire (especially the upper), green above, white-tomentose beneath, sometimes glabrous, 2 to 6 in. long; heads mostly erect, in dense spikes in an open or more commonly dense terminal panicle, the main axis leafy; involucres oblong, glabrous; marginal flowers pistillate, disk-flowers perfect, all fertile.—Common along stream-banks and flats, 10 to 3500 ft.: throughout Cal.; n. to B. C. and Sask., e. to western Nev., s. to L. Cal. (A. heterophylla Nutt. A. vulgaris subsp. heterophylla Hall.) Var. LITTORÀLIS Suksdorf. Stems 2 to 5 ft. high; involucres ovoid, nearly glabrous, 1 to 1½ lines wide; disk-flowers 3 to 7.—Along the coast, Humboldt Co.; n. to B. C. Var. GNAPHALÒDES (Nutt.) Ktze. Stem erect, 1 to 3¼ ft. high; leaves densely white-tomentose on both surfaces, the tomentum usually persistent.—San Diego Co.; San Jacinto Mts.; Modoc Co.; n. to Can., e. to Mo. and Tex. (A. gnaphalodes Nutt. A. vulgaris subsp. gnaphalodes Hall.) Var. LINDLEYÀNA Jepson n. comb. Stems erect, 5 to 15 in. high; leaves narrow, entire or slightly lobed; heads in a narrow short spike-like panicle.—Sierra Nevada in Tulare Co.; e. through the Great Basin. (A. lindleyana Besser. A. vulgaris subsp. lindleyana Hall.) Var. LUDOVICIÀNA (Nutt.) Ktze. Stems simple, erect, from running rootstocks, 1 to 3½ ft. high, herbaceous or essentially so; herbage white-tomentulose or the leaves glabrate above; leaves 1 to 2 in. long, narrowly to broadly lanceolate, dilated above and coarsely toothed, or linear and 3-cleft at apex, or sometimes pinnately divided into 5 linear remote lobes; upper leaves becoming narrow and entire, acute; heads erect or horizontal, disposed in dense spikes, the spikes in a narrow compact panicle leafy-bracteate below; involucres hemispheric, 15 to 25-flowered, 1½ to 2½ lines high.—Montane in S. Cal., 5000 to 6800 ft.: Santa Rosa Mts.; San Bernardino Mts.; Providence Mts.; e. to Tex., n. to Wash. (A. ludoviciana Nutt. A. vulgaris subsp. ludoviciana Hall.)

12. **A. spinéscens** Eat. BUD SAGE. Low compact dwarf (4 to 8 in. high), the woody stems very stocky; herbage, especially the young branches, white-tomentose; leaves 2 to 5 lines long (the petioles 1½ times as long to almost none), pedately 5-parted and the divisions once or twice 3-lobed, the lobes spatulate; heads 5 to 12-flowered, spicate on short lateral branches which persist and in the year following become indurated naked spines; involucres globose, 1½ lines broad; bracts 5 or 6, obovate; both corolla and achene villous-cobwebby.—Desert mesas and plains, 2000 to 3000 ft.: Mohave Desert; Inyo Co. and n. along e. side Sierra Nevada to Lassen Co.; n. to Ore. and Mont., e. to Wyo., Col. and N. Mex.

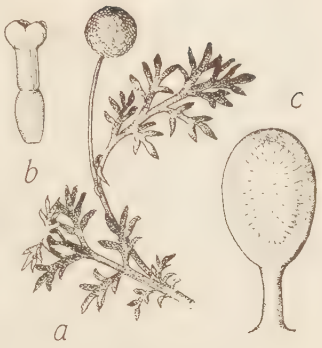
13. **A. pycnocéphala** DC. Stems stout, simple, 1½ to 2¼ ft. high, somewhat woody at base, crowded with leaves up to the inflorescence; herbage densely silky; leaves once to thrice pinnately divided into linear lobes; heads erect, in spikes, the spikes crowded in a dense virgate panicle; heads almost or quite 2 lines in diameter; involucre densely villous.—Sand hills along the coast, Monterey Co. to Humboldt Co.; n. to Ore. (A. campestris L. subsp. pycnocephala Hall.)

14. **A. dracúnculus** L. Stem erect, paniculately branched above, 2 to 4½ ft. high, herbaceous, arising from a rootstock; herbage glabrous, not aromatic; leaves linear to lanceolate, entire or the lowermost deeply 3-cleft, ¾ to 2½ in. long; heads numerous, 1 to 2 lines broad, nodding on very short peduncles in a close or open panicle, the clusters sometimes secund on the slender branches; marginal flowers fertile, disk-flowers perfect but sterile.—Rare in Cal.: San Leandro; Santa Catalina Isl.; Ballona; San Bernardino Mts.; L. Cal. to Col. and Can. (A. dracunculoides Pursh.) Var. GLÁUCA Jepson n. comb. Herbage glabrate, the young parts silky; panicle dense; heads 1 to 1½ lines broad.—Inyo Range; e. to Tex., n. to B. C. and Man.; Siberia. (A. glauca Pall. A. dracunculus subsp. glauca Hall.)

143. **CÓTULA** L.

Low strong-scented herbs. Leaves alternate, dissected or lobed, or with some entire on the same plant. Flowers yellow. Heads slender-peduncled, discoid, low-hemispherical. Bracts of involucre greenish, in about 2 ranks. Receptacle flat or nearly so, naked. Outer series of flowers pistillate only and apetalous. Disk-flowers with 4-toothed corolla, fertile or infertile. Mature achenes raised on pedicels, compressed, spongy-margined or narrowly winged, destitute of pappus. (Greek kotule, small cup or low vessel.)

Annual; leaves pinnately dissected; pistillate flowers in 2 or 3 rows.....1. *C. australis.*
Perennial; leaves some pinnatifid and some entire, sheathing at base; pistillate flowers in a single row.....2. *C. coronopifolia.*



1004. Cotula australis Hook.; *a*, fl. branchlet x 1; *b*, fl. x 8½; *c*, achene x 8½.

1. **C. austrâlis** Hook. f. Fig. 1004. Slender branching annual 2 to 5 (or 12) in. high; herbage with scattered soft spreading hairs; leaves pinnately or bipinnately dissected into linear lobes; heads very small, 1 to 1½ lines broad; bracts of involucre brownish-tipped and with scarious edges; pistillate flowers in 2 or 3 rows, pediceled; disk-flowers nearly or quite sessile; marginal achenes somewhat compressed, minutely hispid on both faces but the margin glabrous.—Nat. from Austr. in streets of towns and cities: Eureka; Berkeley; Oakland; San Francisco; Pasadena; Riverside; San Diego. Jan.-Mar.

2. **C. corònopifòlia** L. Brass Buttons. Fig. 1005. Perennial, somewhat succulent, often subaquatic; stems commonly many and clustered, decumbent, ½ to 1 ft. long; leaves linear, lanceolate, or oblong, entire, coarsely toothed or pinnatifid on the same plant, dilated at base into a short sheath round the stem; heads depressed, 4 to 5 lines broad; pistillate flowers in a single row, on pedicels as long as the involucre, without corolla; disk-flowers on much shorter pedicels.—Nat. from S. Afr. along the coast in saline localities or springy places in the hills, most abundant in the salt marshes: Eureka and San Francisco Bay to coastal S. Cal. Mar.-Dec.

1005. Cotula coronopifolia L., *a*, fl. branchlet x ½; *b*, disk-fl. x 5; *c*, achene x 5.

144. **SOLÌVA** R. & P.

Small depressed annual with rigid short branches, petioled and pinnately dissected leaves, and discoid heads of greenish flowers sessile in the forks. Involucre of 7 or 8 greenish nearly equal bracts. Receptacle flat. Outer series of flowers pistillate and apetalous; innermost flowers perfect but sterile, the corolla 4-toothed. Achenes obcompressed, callus-margined or winged and pointed with the hardened persistent style. Pappus none. (Dr. Salvador Soliva of Spain.)

1. **S. séssilis** R. & P. Plants 2 to 4 (or 10) in. across, minutely pubescent or rusty-villous; one, two or three heads sessile at the very base, the somewhat tortuous stems radiating

from under these; involucral bracts 7 or 8, oblong, acute, pilose-pubescent; pistillate flowers 9 to 12; each wing of the achene terminating above in an incurved tooth; staminate flowers fewer than the pistillate, 7 to 9; styles stout, subulate, conspicuously exserted beyond the disk-corolla. — Moist ground: Hupa; Mendocino Co.; Howell Mt.; Oakland; San Francisco; Santa Cruz Mts.; Santa Barbara. Mar.-May. Perhaps nat. from Chile.

Tribe 11. **Senecióneae.** Groundsel Tribe

Herbs or a few shrubs or woody-based plants. Leaves alternate or basal. Bracts of the involucre little or not at all imbricated, mostly in 1 or 2 rows. Receptacle naked. Flowers of both disk and ray yellow, except Petasites. Anthers not caudate. Pappus-bristles soft, commonly copious, most often white.

145. **CROCÍDIUM** Hook.

Small annual herbs. Stems simple, several from a tuft of basal leaves and bearing a single terminal head, naked above, the cauline leaves only on lower third or half and often reduced. Basal leaves fleshy. Herbage flocculent-woolly or glabrate above. Heads with disk- and ray-flowers, all the flowers fertile. Involucre broadly hemispherical, its bracts 8 to 12, nearly equal, thin-herbaceous. Receptacle conical. Flowers golden yellow. Anthers with deltoid-ovate acute tips. Style-branches short and broad, terminated by a large deltoid appendage. Achenes covered with oblong papillae, these developing spiral threads when wetted. Disk-flowers with pappus, commonly none in the ray. Pappus-bristles equal, white, barbellate, soon deciduous. (Diminutive of Greek croce, loose thread, in reference to the wool persistent in the leaf axils.)

1. **C. multicáule** Hook. Stems erect, 3 to 6½ in. high; herbage flocculent-woolly when young, soon glabrate; basal leaves obovate or spatulate, 2 to 7 lines long, the cauline ones only on lower part of stem, lanceolate, abruptly attenuate, 1 to 2 lines long; ray-flowers 8 to 12, the rays elliptic to oblong, 2 lines long.—Open cool slopes of hills, 1500 to 4000 ft.: Mariposa; Arroyo Mocho, Mt. Hamilton Range; Mendocino Co. to Siskiyou Co.; n. to B. C. and Ida. Mar.-May.

146. **PSATHÝROTES** Gray

Low annuals with scurfy or tomentose herbage. Leaves alternate, broad and rounded, petioled. Heads discoid, the flowers all perfect and fertile. Involucre hemispheric, its bracts in 2 or 3 series. Receptacle flat. Corolla yellow, sometimes turning purplish, with the proper tube very short (the filaments thus inserted near the base), the throat elongated-cylindric, and the short lobes woolly. Style-branches flattish, obtuse. Achenes narrow-turbinate, densely white or rusty villous. Pappus-bristles numerous, short, scabrous, white or rusty. (Greek psathurotes, brittleness, referring to the stems.)

Outer involucral bracts with recurved or spreading tips; leaves thick . . . 1. *P. ramosissima.*
Outer involucral bracts with erect tips; leaves thinner . . . . . 2. *P. annua.*

1. **P. ramosíssima** (Torr.) Gray. Stem widely and more or less dichotomously much-branched, forming a low compact rounded and densely leafy plant 2 to 6 in. high and 3 to 12 in. broad; herbage white with a close tomentum, strongly turpentine-scented; leaves roundish, subcordate or cuneate at base, thick, irregularly toothed above base, 4 to 9 lines broad, the petioles 1 to 4 lines long; heads 3 to 4 lines high, solitary on axillary peduncles, the naked peduncles at maturity recurved.—Desert floors and washes, 100 to 4000 ft.: Inyo Co.; e. Mohave Desert; Colorado Desert; s. to L. Cal., e. to Ariz. Apr.-May.

2. **P. ánnua** (Nutt.) Gray. Stem freely and somewhat openly branched from the base, forming plants 1 to 6 in. high and 1½ times as broad; herbage puberulent, the leaves scurfy-pubescent; leaves fanshaped, irregularly dentate, 4 to 9 lines broad, on petioles ½ to as long; heads 3 lines high, borne in terminal glomerules and solitary on peduncles in the forks, the peduncles about 2 to 8 lines long.—Desert cañons and flats, rare in Cal.: Rabbit Sprs.,

s. Mohave Desert; Rock Cañon, e. Kern Co.; Lone Pine, Inyo Co.; e. to Nev., Utah and Ariz.

147. **RAILLARDÉLLA** Gray

Low perennial herbs. Leaves narrow, entire, mostly basal, the cauline alternate or none. Heads commonly solitary, or rarely in 2s or 3s, with yellow flowers, mostly discoid, sometimes radiate. Involucral bracts linear, in a single series, barely overlapping. Receptacle flat. Disk-corollas with short tube, elongated throat, and 5 short glabrous lobes. Style-appendages flattish, hispidulous, with lanceolate or cuspidate tips. Achenes linear, pubescent. Pappus of 10 to 25 slender soft-plumose bristles. (Diminutive of Raillardia, a shrubby Composite genus of the Hawaiian Isls.)

Stems leafy, arising from the branched crown of a very short root; leaves linear; pubescence hirsute.
- Leaves acute; lowest leaves not sheathing; heads discoid; pappus-bristles longer than the achene; herbage greenish; s. Sierra Nevada ..... 1. *R. muirii.*
- Leaves obtuse or obtusish; lowest very small leaves opposite, distinctly sheathing at base, 2 to 3 lines long; heads with 2 or 3 rays; pappus-bristles shorter than the achene; herbage hirsute-canescent; mts. of n. Lake Co.... 2. *R. scabrida.*

Stem scapose or with occasionally a few small leaves below; leaves crowded in a basal tuft or on short sterile shoots; pubescence not hirsute.
- Herbage silvery-tomentose; scapes ½ to 4 in. high, arising from the branched crown of a stout root; rays none ..... 3. *R. argentea.*
- Herbage green, not tomentose; scapes mostly 4 to 11 in. high, arising from a horizontal rootstock; rays none or present ..... 4. *R. scaposa.*

1. **R. mùirii** Gray. Stems erect, several from the branched root-crown, 9 to 12 in. high; herbage roughish-hirsute, the stems glandular-villous above the base and up to involucre; leaves linear or lanceolate-linear, acute, sessile; heads terminal and 1 or 2 lateral, 5 to 7 lines high, wholly discoid; involucres campanulate, hirsute and glandular-villous; pappus-bristles 10 to 12, 4 lines long.—Southern Sierra Nevada, 4000 to 7000 ft., in Fresno Co.: Tehipite Valley; Mt. Woodworth.

2. **R. scábrida** Eastw. Stems several, assurgent or ascending from the short branches of the root-crown, 5 to 8 in. high; leaves linear, sessile, obtuse or sometimes auricled at base, 4 to 6 lines long; lowest leaves 2 to 3 lines long, opposite, sheathing at base; heads broadly cylindric, 6 lines high, solitary or 2 or 3 in loose cymes; rays 2 or 3, 1½ lines long; pappus-bristles 1½ lines long.—Gravelly crests or slopes, 6500 to 7600 ft., n. Lake Co.: Snow Mt.; Mt. Hull.

3. **R. argéntea** Gray. Scapes ½ to 4 in. high, reddish and puberulent; leaves narrowly oblanceolate, acute, covered with a silvery felt, ½ to 1 or 2 in. long; heads 7 to 10 lines high; involucres narrowly campanulate, 3½ to 4½ lines high, the bracts linear, acuminate; corolla yellow.—High montane, 10,000 to 11,500 ft.: Mt. San Gorgonio; Sierra Nevada from Tulare Co. to Lassen Peak; White Mts.; n. to southern Ore.

4. **R. scapòsa** Gray. Fig. 1006. Scapes 2 or 4 to 11 in. high, from stoutish rootstocks; herbage viscid-glandular and sparingly pilose; leaves narrowly linear-oblanceolate, 1 to 4 in. long; flowering heads 7 to 10 lines high; involucres cylindraceous, 10 to 40-flowered; corolla light yellow; rays none or sometimes 1 to 3 or 5 and 1

1006. Raillardella scaposa Gray; *a*, habit x ⅓; *b*, fl. x 1½.

to 2 lines long.—Montane meadows, 7800 to 11,000 ft., Sierra Nevada from Tulare Co. to Tuolumne Co. Var. PRINGLEI Jepson n. comb. Rays 4 or 5, very conspicuous, 6 to 9 lines long, 3 to 7 lines wide, deeply 2 or 3-notched at apex. —High montane: Scott Mts.; Mt. Silliman; Farewell Gap. (R. pringlei Greene.)

148. **CACALIÓPSIS** Gray

Floccose-woolly perennial herbs, the stoutish stems from stout rootstocks. Leaves mostly basal, round-cordate, palmately cleft or parted. Heads few, corymbosely disposed at the summit of the nearly naked stem, rayless, the flowers yellow, numerous. Involucre broadly campanulate, its bracts many, linear-lanceolate, acuminate, rigid rather than herbaceous. Anthers entire at base. Style puberulent below the slightly flattened branches. Achenes 10-nerved. Pappus copious, soft and white, equaling the corolla. (Greek kakalia, ancient Greek name of some plant, and opsis, likeness.)

1. **C. nardòsmia** Gray. Stem erect, 1 to 1½ ft. high; basal leaves 2½ to 6½ in. broad, the divisions broad, cleft or toothed, the petioles 2½ to 4 in. long; cauline leaves few, similar to the basal but smaller; heads about 1 in. high; flowers honey-scented.—Montane, 3000 to 6000 ft.: Geysers, Sonoma Co.; n. Lake Co.; Mendocino and Humboldt Cos.; n. to Wash. Apr.-May.

149. **PETASÌTES** Gaertn. SWEET COLTSFOOT

Perennial herbs with creeping rootstocks from which arise in early spring scape-like flowering stems (with many scale-like leaves) and later ample leaves. Heads in a dense corymb, subdioecious, i. e., the plants mostly sterile or mostly fertile, the whitish sterile flowers with tubular 3 to 5-cleft corolla, and the pinkish fertile flowers with ligulate corolla. Achenes 5 to 10-ribbed. Pappus elongating with age, very soft and white. (Greek petasos, a broad-brimmed hat, in allusion to the large leaves.)

1007. Petasites palmata Gray; *a*, leaf arising from rootstock x ¼; *b*, scaly stem and infl. arising from rootstock x ¼; *c*, ray-fl. x 1½; *d*, disk-fl. x 1½.

1. **P. palmàta** (Ait.) Gray. Fig. 1007. Stem erect, 7 to 10 in. high, glandular-pubescent, its bract-like scales 1½ to 2½ in. long; leaves roundish in outline, palmately cleft to below the middle into 7 to 10 lobes, green and nearly glabrous above, densely white-tomentose beneath, at least when young, 5 to 16 in. wide, the lobes denticulate, sinuately toothed or 3-lobed at apex; petioles 4 to 16 in. long; heads 6 to 7 lines high; "sterile" heads with mostly perfect (sterile) flowers but the marginal ones pistillate; "fertile" heads with mostly pistillate flowers and few central perfect ones.—Deep shades of wooded cañons in ranges near the coast from the Santa Lucia and Santa Cruz mountains to Humboldt Co., thence e. to Siskiyou Co.; n. to Alas., e. to N. Eng.

150. **LÙINA** Benth.

Low perennial herbs with many erect simple stems. Leaves alternate, entire, sessile. Heads rayless, 10 to 19-flowered, disposed in terminal corymbs. Flowers yellow. Involucre oblong-campanulate, its bracts 8 to 12, linear,

rigid, carinately 1-nerved, equal. Corolla-throat very narrowly funnelform, equaling the narrow tube, which is slightly enlarged downward. Anthers sagittate at base. Style glabrous, its flattened branches papillose on the back. Pappus soft and white. (Anagram of Inula.)

1. **L. hypoleùca** Benth. var. **californica** Gray. Stems several from the shortly branched woody crown of a very stout root, erect, 7 to 10 in. high, white-tomentulose; leaves oblong-ovate to elliptic, white-tomentose beneath, becoming glabrous and green on the veiny-reticulate upper surface, 1 to 2 in. long; heads 5 to 6 lines high; achenes glabrous.—Barren rocky cliffs in the coast region, 20 to 5000 ft., a rare plant: Santa Cruz Mts.; Chimney Rock, Mendocino Co.; Grouse Mt., Humboldt Co.; Requa, Del Norte Co.

151. **ERECHTÌTES** Raf. Fireweed

Coarse annuals with rank odor. Leaves alternate, ours auriculate-dilated or lobed at base. Heads discoid, paniculately cymose, the whitish or yellowish flowers of 2 kinds: central flowers perfect, their corollas with filiform tube and 4 or 5-lobed cupshaped limb; marginal flowers pistillate, their corollas filiform, slightly dilated at summit and 2 to 4-toothed. Pappus-bristles elongated, very soft and fine. (Greek name of a groundsel in Dioscorides' Materia Medica.)

Leaves deeply pinnatifid; heads little calyculate.....1. *E. arguta.*
Leaves denticulate; heads markedly calyculate.....2. *E. prenanthoides.*

1. **E. argùta** DC. New Zealand Fireweed. Stem stout, erect, freely branching, 2 to 4 ft. high; herbage white-tomentulose, early glabrate, at least in part; leaves oblong-ovate in outline, deeply pinnatifid, 3 to 4½ in. long, the petiole winged, auriculate-dilated at base and toothed or incised, the upper leaves smaller and less lobed; heads in glomerate or in loose cymes, the cymes disposed in panicles; involucres cylindric, 2 lines high; pappus white; achenes 5-nerved, hispidulose, with a callus-like cup at summit.—Redwood forest, Mendocino Co. to Del Norte Co.; introduced from New Zealand or Australia.

2. **E. prenánthoìdes** DC. Australian Fireweed. Stem erect, 4 to 8 ft. high; herbage obscurely puberulent or nearly glabrous, the leaves green above, pale and minutely arachnoid beneath; leaves linear-lanceolate, irregularly denticulate, 3 to 6½ in. long, attenuate below to a strongly auriculate base; panicle large, widely branched (½ to 1 ft. broad), the pedicels of the heads filiform, 1 to 4 lines long; heads 3 lines high.—Native of Australia, naturalized in 1918 in Humboldt Co., since spreading rapidly.

152. **SENÈCIO** L. Groundsel

Herbs or shrubs with alternate leaves. Heads in terminal cymes or sometimes solitary, the cymes corymbose, paniculate, glomerate or capitate. Heads many-flowered. Flowers yellow in both disk and ray, the latter pistillate or none. Involucre cylindrical to campanulate, with 1 or 2 rows of bracts of equal length, naked or with some small short bracts at base; bracts erect or connivent. Achenes terete. Pappus of abundant white and soft hairs. (Latin senex, an old man, on account of the white hair-like pappus.)

A. Stems erect or ascending, never climbing.

1. Perennials.

a. Stems with mostly many and nearly equal leaves.

Leaves pinnately lobed or parted or sometimes the upper narrowly linear and entire.
Herb; stem simple; leaves comparatively broad, saliently pinnatifid and laciniate or dentate .....1. *S. clarkianus.*
Low shrubs or bushes.
Leaves once pinnately divided into 3 to 9 linear or filiform divisions; involucral bracts herbaceous; mainland .....2. *S. douglasii.*
Leaves once or twice pinnately divided into many narrow or linear segments; involucral bracts fleshy or thickened; insular.....3. *S. lyoni.*
Leaves entire or dentate, or some laciniate-dentate, never narrowly linear.
Plants low, 2½ to 10 in. high; heads solitary and terminal, or few in a terminal cyme; bracts of the involucre penicillate at tip.....4. *S. fremontii.*

Plants tall, 1 or 2 to 6 ft. high; heads cymose or corymbosely cymose.
Heads radiate.
Herbage glabrous or glabrate or nearly so; pubescence, if any, never viscid; rays commonly 5; stems commonly few or several from the base.
Leaves (4 or) 6 lines to 2 in. wide.
Leaves cordate to truncate at base, conspicuously and abruptly petioled ..... 5. *S. triangularis.*
Leaves cuneate or tapering at base, passing gradually into a winged petiole or sessile ..... 6. *S. serra.*
Leaves ½ to 1½ lines wide (linear and entire) ... 7. *S. multicapitatus.*
Herbage with a viscid pubescence; San Bernardino Mts. ..... 8. *S. parryi.*
Heads rayless; S. Cal. coast ..... 9. *S. astephanus.*

b. Stems few-leaved, naked above or the upper leaves reduced in size.

Stems solitary, tall and simple, arising from a cluster of coarsely fibrous roots.
Bracts of the involucre not black-tipped.
Rays present.
Leaves entire; herbage glabrous; involucral bracts herbaceous ..... 10. *S. hydrophilus.*
Leaves dentate or denticulate, sometimes a little saliently incised; involucral bracts, a little thickened or fleshy ..... 11. *S. mendocinensis.*
Rays only 1 or 2 or none ..... 12. *S. aronicoides.*
Bracts of the involucre commonly blackish-tipped; stem leafy to middle .. 13. *S. lugens.*
Stems few to several, often in tufts, mostly from rootstocks.
Bracts of the involucre blackish-tipped; stems 1 to 3, almost naked, arising from a stout horizontal rootstock ..... 14. *S. covillei.*
Bracts of the involucre not black-tipped.
Herbage glaucous or glaucescent, mostly glabrous; rays short, few ..... 15. *S. clevelandii.*
Herbage not glaucous or glaucescent; rays conspicuous.
Plants low, commonly only 1 to 6 in. high.
Rays yellow; leaves entire; alpine.
Involucre cylindric; herbage glabrate; leaves plane ..... 16. *S. petrocallis.*
Involucre campanulate; herbage white-tomentose; leaves with the margin more or less revolute ..... 17. *S. muirii.*
Rays deep orange; involucre hemispheric; leaves dentate or serrate; low montane ..... 18. *S. greenei.*
Plants taller, mostly 1 to 3 (or 5) ft. high.
Herbage permanently canescent with pannose tomentum (rarely glabrate); leaves entire.
Leaves mostly roundish or elliptic-ovate, white above and below .... 19. *S. canus.*
Leaves linear-oblanceolate, white-tomentose below, glabrate and green above ..... 20. *S. howellii.*
Herbage not permanently canescent or tomentose.
Heads mostly 6 to 8 lines high.
Leaves entire to serrate or pinnately parted.
Leaves entire or serrate, not lobed or divided, gradually passing into the petiole; rare.
Herbage green; leaves entire or serrate, acute, apiculate at apex ..... 21. *S. fastigiatus.*
Herbage white-tomentulose; leaves serrate, obtuse ... 22. *S. neomexicanus.*
Leaves rather abruptly petioled, orbicular, or pinnately parted or divided with the terminal division mostly orbicular; herbage glabrate; mts. of S. Cal. ..... 23. *S. ionophyllus.*
Leaves mostly once pinnately divided into separate or nearly distinct divisions, the divisions again lobed or incised or toothed.
Herbage more or less tomentulose; North Coast Ranges mostly ..... 24. *S. eurycephalus.*
Herbage glabrous; South Coast Ranges mostly ..... 25. *S. breweri.*
Heads mostly 4 to 5 lines high; leaves (at least the basal ones) abruptly or definitely petioled.
Leaves pinnately divided into nearly distinct roundish leaflets; stems very slender ..... 26. *S. bolanderi.*
Leaves (at least the basal ones) mostly oval, crenulate, sometimes pinnatifid at base ..... 27. *S. pauciflorus.*

2. Annuals.

Indigenous species; involucral bracts not black-tipped, sometimes brownish or yellowish.
Rays conspicuous; involucre nearly naked at base ..... 28. *S. californicus.*
Rays none; involucre naked at base ..... 29. *S. mohavensis.*
Introduced species (except no. 32).
Bracts of the involucre black-tipped, the involucre with small bracts at base; rays none ..... 30. *S. vulgaris.*

Bracts of the involucre not black-tipped, the involucre naked at base; rays very inconspicuous, recurved.
Herbage pubescent; involucre cylindric....31. *S. sylvaticus.*
Herbage glabrous; involucre somewhat flask-shaped....32. *S. aphanactis.*

B. Stems climbing.

Perennial herb; introduced species....33. *S. mikanioides.*

1. **S. clarkiànus** Gray. Stem simple, erect, striate-angled, 3 to 4 ft. high; leaves lanceolate or sometimes oblong in outline, 2 to 9 in. long, pinnatifid or laciniate-dentate, the salient lobes or teeth lanceolate or triangular and very acute; cauline leaves sessile, the basal narrowed to a long winged petiole; inflorescence cymose or somewhat paniculate; heads several to many, about 6 lines high; bracts of involucre linear, subulate at apex, the calyculate bracts several, slender, loose; rays about 7 or 8, 4 to 5 lines long, narrow.—Moist ground 7000 to 9000 ft.: Sierra Nevada from Mariposa Co. to Tulare Co. Aug.-Sept.

2. **S. douglásii** DC. Creek Senecio. Much-branched bush 2 to 6 ft. high, leafy up to the inflorescence; herbage at first whitish-tomentose, later more or less or even quite glabrate; leaves 1 to 3 in. long, pinnately divided into 3 or 5 to 9 lobes, the lobes rather remote, narrowly linear, revolute, the upper pinnately 3-lobed with the middle lobe several times longer, or the uppermost leaves entire; heads 6 to 7 lines high; involucres campanulate or broadly turbinate, the bracts linear with attenuate tips, dorsally carinate below; rays 10 to 13, 5 lines long; achenes linear, canescent, 2 lines long.—Dry stream beds in the foothills, sandy floors or gravelly plains in the valleys, 200 to 4250 ft.: throughout cismontane Cal.; Inyo Co.; Mohave Desert; e. to Tex. and Nev. July-Oct. Var. monoénsis Jepson n. comb. Less woody, copiously branched from the main stem; herbage bright green, glabrous; branches often long and decumbent.—Inyo and Mono Cos. (S. monoensis Greene.)

Fig. 1008. 1008. Senecio douglasii DC.; *a*, fl. branchlet x ½; *b*, fr. head x ½; *c*, disk-fl. x 1½; *d*, achene and pappus x 1½.

3. **S. lỳoni** Gray. Stems branching, somewhat woody at base, 2 to 3 ft. high; herbage when young tomentose, soon glabrate except for conspicuous dense tufts of wool in the leaf axils; leaves ovate in outline, 1½ to 3 in. long, once or twice pinnately divided into many narrow or linear obtuse segments, the petioles ¼ to ¾ in. long, auricled at base or merely dilated; inflorescence loosely cymose, the peduncles with a few minute subulate bracts; involucres hemispheric, 3 to 4 lines high, their bracts linear, slightly keeled, scarious-margined, the acuminate tips densely pubescent. — Santa Catalina and San Clemente islands; s. to L. Cal.

4. **S. fremóntii** T. & G. var. **occidentális** Gray. Stems many, branching, ascending or erect, arising from a branched root-crown, 2½ to 10 in. long; leaves round-obovate, elliptic or spatulate to oblong, coarsely few-toothed above the middle, thick, ½ to 1 in. long, gradually narrowed to a broad petiole 2 to 6 lines long, the upper often incised, sessile by a broadish base; heads 4 to 5 lines high, 2 to 8 in a loose terminal cyme, subtended by a few loose bractlets; bracts of the involucre linear, narrowly scarious-margined, shortly acuminate, penicillate at tip; rays 7 to 9, pale yellow, 3 to 5 lines long.—Alpine or subalpine, mostly granite slopes, 7800 to 13,000 ft.: Sierra Nevada from Tulare Co. to Mariposa

1009. Senecio triangularis Hook; *a*, top of flowering stem x ¼ ; *b*, leaf x ¼ ; *c*, head x 1.

Co.; n. to Wash. July-Aug. (S. occidentalis Greene.)

5. **S. triangulàris** Hook. Fig. 1009. Stems slender, erect, several from a very stout horizontal rootstock, 2 to 6 ft. high; rootstock compact, bearing numerous cord-like roots; herbage glabrous; leaves oblong-ovate to ovate-lanceolate, sometimes triangular-hastate, saliently serrate, serrulate or subentire, cordate or truncate at base, 1¼ to 5½ in. long, the petioles ¼ to 2 in. long; heads 4 to 5 lines high, several to many in a terminal corymbose cyme; rays 6 to 12, deep yellow, 2½ to 3½ lines long.—Stream borders and bogs in the mts., 4000 to 9000 ft.: San Jacinto Mts.; San Bernardino Mts.; San Gabriel Mts.; Sierra Nevada from Tulare Co. to Shasta Co.; n. Humboldt Co. to Del Norte and Siskiyou Cos.; n. to B. C. and Sask., e. to Col. July-Sept.

6. **S. sérra** Hook. Stems erect, simple, 1½ to 3 ft. high, leafy up to the inflorescence, ending above in a many-headed rather close paniculate cyme; herbage glabrous; foliage rather strict; leaves oblong-lanceolate to lanceolate, denticulate, sometimes nearly entire, 2½ to 5½ in. long, narrowed to petioles 1 to 3 in. long, the cauline mostly sessile or very shortly petioled; heads broadly turbinate-cylindric, 4 lines high; bracts of the involucre linear-lanceolate, scarious-margined, the acute tips penicillate, often dark; rays none; achenes glabrous.—Montane valleys or flats, 4700 to 6600 ft.: Sierra Co. to Modoc Co.; n. to Wash., e. to Col. Var. INTEGRIÚSCULUS Gray. Leaves very thin, entire or minutely denticulate, sessile or on petioles 2 to 3 lines long.—Montane valleys, 5000 to 6000 ft.: Sierra Valley; e. Nevada Co.; Nev. and e. Ore. to Wyo. Var. ÁLTIOR Jepson n. var. Stem simple, erect, 3½ to 4½ ft. high; herbage glabrate or minutely soft-hairy; leaves linear-lanceolate, acute, regularly serrulate, 3 to 5 in. long, narrowed at base to a winged petiole (2 lines to 2 in. long) or sessile; heads narrow-cylindric, 3 to 4 lines high; bracts of the involucre 8, linear, penicillate at the slightly spatulate tips; rays 5, 3 lines long; achenes glabrous.—Montane, 8000 ft., s. Sierra Nevada in Tulare Co. **(Mineral King, Jepson 1156, type).**

7 **S. múlticapitàtus** Greenm. Stems several from the branched root-crown of a stout taproot, 8 to 14 in. high; herbage glabrous; leaves narrowly linear, entire, acute, often curved, spreading or even deflexed, 1½ to 3 in. long, ½ to 1½ lines wide; heads 3 lines high, numerous in a terminal leafy-bracteate cyme; involucres subcylindric, their bracts 8 or 9, linear, acute, scarious-margined, pubescent at tip; calyculate bracts few or none; rays 4 or 5, yellow; disk-flowers 10 to 12; achenes glabrous.—Montane, 8600 to 9600 ft., San Bernardino Mts.: Santa Ana Cañon; Mt. San Gorgonio. (S. serra var. sanctus Hall.)

8. **S. párryi** Gray. Stems erect or ascending, 1 to 1½ ft. high, leafy throughout or the leaves reduced above, terminating in a corymbose cyme; herbage glandular-villous; leaves oblong or elliptic, sometimes lyrately narrowed below, denticulate to doubly dentate, auriculate-sessile by a broad base, 1½ to 5 in. long; heads about 6 lines high; involucres sparsely calyculate; rays about 8; achenes strigulose.—San Bernardino Mts.; e. to Ariz. July-Sept.

9. **S. astéphanus** Greene. Stem solitary, erect, 12 to 20 in. high, leafy below and at base; herbage white-tomentulose, more or less glabrate; leaves oblong-obovate, 4 to 8 in. long, denticulate or saliently subulate-toothed, gradually narrowed to a petiole ⅕ to ⅔ as long; heads hemispheric, 6 to 7 lines high, disposed in a compact cyme or corymbosely paniculate. — Montane, the known stations few and the individuals infrequent: San Luis Obispo Co.; Mt. Lowe (F. W. Peirson); Mt. Wilson. June. (S. ilicetorum Dav.)

10. **S. hydróphilus** Nutt. Fig. 1010. Stem simple, erect, often purplish, 2 to 4⅓ ft. high, few-leaved, ending above in an ample corymbose cyme or the cyme often condensed and as if capitate; herbage somewhat succulent, glabrous, more or less glaucous; basal and lower leaves oblong-oblanceolate, entire or rarely denticulate, fleshy-coriaceous, 8 to 13 in. long, passing gradually into margined petioles 2 to 7 in. long, the upper cauline ones sessile or clasping; heads 4 to 5 lines high; involucres campanulate, slightly calyculate, the bracts with broad scarious margins, bearing a black spot just below tip; rays none or rarely few.—Marshes and swamps, 10 to 7000 ft.: San Francisco Bay region to Siskiyou Co.; Nevada Co. to Modoc Co.; n. to B. C., e. to Col. May-Aug.

1010. Senecio hydrophilus Nutt.; *a*, infl. x ⅓; *b*, leaf x ⅓; *c*, disk-fl. x 2.

11. **S. méndocinénsis** Gray. Stem simple, erect, robust, leafy below or to the middle, naked above, 2 to 3 ft. high, arising from a dense cluster of stoutish fibrous roots, ending above in a very compact or a somewhat loose cyme; herbage thinly arachnoid or somewhat floccose; lower leaves oval or ovate to oblong-lanceolate, dentate or denticulate, rarely a little saliently laciniate, somewhat succulent, acute to subcordate at base, 1 to 5 in. long, passing into winged petioles ⅕ to as long; upper leaves mostly lanceolate with a broad sessile base; heads broadly campanulate, 5 to 6 lines high; bracts of the involucre linear-subulate, the calyculate ones few or several, slender, loose; rays 5 to 12, oblong, 4 to 5 lines long.—Gravelly slopes or valleys, 2500 to 6500 ft.: Mendocino and Humboldt Cos. to Siskiyou Co.; Amador Co. to Tuolumne Co. June-July. (S. whippleanus Gray.)

12. **S. arónicoides** DC. Stem simple, robust, arising from a cluster of fibrous roots, 1 to 3½ ft. high, leafy chiefly at the base or below the middle; younger parts loosely woolly, soon glabrate; basal leaves ovate or round-ovate to oblong, irregularly and coarsely toothed, denticulate or almost entire, 3 to 8 in. long, on petioles 1 to 5 in. long; cauline leaves similar or mostly lanceolate, often more irregularly or saliently toothed than the basal ones, drawn down to a winged petiole and auricled at base, the uppermost bract-like; inflorescence a compound terminal cyme, or frequently much reduced or condensed and the heads few; heads 3 to 5 lines high; involucral bracts lanceolate, either with or without purple tips; flowers in a head 10 to 26; rays none, rarely 1 or 2; achenes 1½ lines long, glabrous.—Thickets or sparsely chaparral-covered country in the hills, 50 to 4000 ft.: Coast Ranges from Siskiyou Co. to San Mateo Co. Common and widely distributed in the district but the individuals usually solitary, never locally abundant. May.

13. **S. lùgens** Rich. var. **exaltàtus** Gray. Stem simple, erect, ½ to 3 ft. high, few-leaved or naked above, arising from a dense cluster of cord-like

roots borne on very short rootstock, ending above in a rather compact or open cyme of several to many heads; herbage lightly floccose-woolly when young, soon glabrate and green; leaves broadly ovate or oblong to obovate or broadly oblanceolate, denticulate to entire, 3 to 6½ in. long, tapering into a margined petiole ⅓ to ⅔ as long; upper cauline leaves lanceolate or reduced and bract-like; heads 4 to 5 lines high; involucres campanulate, the bracts lanceolate, obtuse or acute or acuminate, the tips often blackish; rays 10 to 12, conspicuous.—Wet ground in the mts., 5400 to 9000 ft.: Sierra Nevada from Tulare Co. to Eldorado Co.; Warner Mts.; n. to B. C. Var. MEGACÉPHALUS Jepson n. var. Heads much larger (8 to 9 lines high).—Mts. of Tulare Co. (pine forest, Colony Mill to Marble Fork, Jepson 668, type).

1011. Senecio covillei var. scorzonella Jepson; *a*, *b*, habit x ½; *c*, head x 1.

14. **S. covíllei** Greene. Fig. 1011. Stems 1 to 3 from a horizontal rootstock, erect, simple, 10 to 14 in. (or 2 ft.) high, the leaves in a mostly basal tuft; herbage thinly tomentulose, soon becoming green and glabrate; leaves oblong-oblanceolate to linear-oblong, acute or acuminate, denticulate, saliently serrulate or sometimes subentire, narrowed downward to an entire and very broad (1 to 6 lines wide) or winged petiole or sessile by a very broad base, the whole 2 to 4½ (or 6½) in. long; head 3½ to 5 lines high, few to many in very compact or in somewhat loose cymes; bracts of the involucre black-tipped; rays 5 to 7.—High montane, 8000 to 11,000 ft.: Sierra Nevada from Tulare Co. to Mariposa Co. July-Aug. Var. SCORZONÉLLA Jepson n. comb. Fig. 1011. Herbage permanently white-lanate; leaves less serrate.—High montane, 7200 to 9500 ft.: Inyo Co. to Mariposa Co. (S. scorzonella Greene.)

15. **S. clevelándii** Greene. Stems simple, 1½ to 2 ft. high, corymbosely branched at summit, but the inflorescence rather strict; herbage glaucous and glabrous, except the small tufts of white tomentum in the axils of the upper leaves and bracts; leaves in a basal tuft and sparsely cauline, oblong, 2 to 3 in. long, tapering to both ends from the middle or broadest above the middle, entire, obtuse, 2 to 3 in. long, on petioles 2½ to 5 in. long; uppermost leaves similar but smaller; heads 3 lines high, numerous in a compound corymb; rays 5 or 6, deep orange, 2 lines long; achenes glabrous.—Cañon bottoms and moist beds of rivulets in the hills: Napa Co. to Lake Co. July.

16. **S. petrocállis** Greene. Stems several to many from the branched crown of a taproot, 3 to 5½ in. high, nearly naked, the leaves in a basal tuft; herbage glabrate; leaves oblong-oblanceolate, entire, apiculate, 6 to 10 lines long, gradually tapering into a petiole 1 to 3 times as long; heads 3 to 4 lines high, few in a terminal cyme; rays 10 to 12.—Alpine, on rocky slopes, 10,000 to 12,000 ft.: Mt. Dana; e. to Rocky Mts.

17. **S. mùirii** Greenm. Stems erect or ascending, 1½ to 2½ or 6 in. high, arising from the branches of the root-crown, almost naked, with the leaves in basal tufts, thus forming dense mats 2 to 7 in. wide; herbage white-tomentose or becoming glabrate and green or partly so; leaves oblanceolate, entire or oblong, gradually narrowed below to a margined petiole with a broad base, the whole 1 to 2 in. long; heads 3½ to 4 lines high, terminal on the stems, solitary or in a 3 or 4-flowered cyme; involucres campanulate;

rays 9 to 13, 2½ lines long.—Alpine, 11,500 to 12,500 ft.: Mt. Whitney to Mt. Dana and Sonora Pass.

18. **S. grèenei** Gray. Stems erect from slender running rootstocks, 3 to 5 (or 11) in. high, bearing 1 to 3 short-peduncled heads; herbage lightly floccose-tomentose; basal leaves orbicular to roundish-ovate, obtuse or acute, cuneate to truncate at base, dentate or serrate, ½ to 1 or 1½ in. long, the petioles 1 to 1½ times as long; cauline leaves few, the lower similar to the basal, the upper oblong or lanceolate, often contracted downward towards the broad sessile base, entire; heads 8 lines high; bracts of involucre linear, no calyculate ones at base; rays deep orange, 7 to 10 lines long; style-tips of disk-flowers conspicuously penicillate-margined and with a central cusp; achenes glabrous.—Montane, North Coast Ranges, 1500 to 2500 ft., locally rare: Capell Cañon, Napa Range; Mt. St. Helena; mts. near the Geysers, ne. Sonoma Co.; Mt. Sanhedrin; Red Mt., n. Mendocino Co.; Bottlerock Mt., Lake Co.; Indian Valley, ne. Lake Co; Bennett Spr., w. Glenn Co. May.

S. ÉLEGANS L. Purple Ragwort. Leaves pinnatifid; bracts of the involucre shallowly corrugated longitudinally; calyculate bracts not corrugated, conspicuously black-tipped; rays showy, purple; achenes ribbed.—Garden plant from S. Afr.; adv. at San Francisco.

19. **S. cânus** Hook. Stems erect, arising from a more or less horizontal rootstock, 5 to 12 (or 15) in. high; herbage white-tomentose with a permanent felt-like tomentum, or in age sometimes flocculent, rarely glabrate; leaves orbicular or roundish-ovate to elliptic, entire, ¼ to 1¼ in. long, rarely serrate or sometimes a little dentate at apex, on petioles ¼ to 1¾ in. long or the upper ones sessile; heads 3 to 5 lines high, few to mostly many in terminal cymes; rays 5 to 8; achenes glabrous.—Montane, 5500 to 11,500 ft.: Sierra Nevada from e. Tulare Co. to Fresno Co. and Mono Co.; Warner Mts., Modoc Co.; n. to B. C., e. to Rocky Mts. June-July.

20. **S. howéllii** Greene. Stems erect or nearly so, arising from a branching rootstock, 10 to 12 in. high, leafy mainly below, the leaves in basal tufts; herbage closely white-tomentose, the upper surface of the leaves becoming green and glabrate, the stems partly glabrate; leaves linear-oblanceolate, entire or rarely with a few teeth, ¾ to 1½ in. long, gradually narrowed to a petiole as long; inflorescence a corymbose cyme; heads about 4 lines high; rays 6.—Montane, n. boundary Del Norte Co.; n. to Ore.

21. **S. fastígiàtus** Nutt. var. **làyneae** Gray. Stems few or several from the base, erect, 10 to 23 in. high, the leaves mostly in basal tufts or on lower half of stem, reduced above; herbage with scattered flocs of wool, otherwise glabrate; leaves oblanceolate, entire or somewhat saliently serrulate, acute, apiculate, 1¼ to 2¼ in. long, gradually narrowed to a petiole ½ to as long; inflorescence a corymbose cyme of few to many heads; heads 5 to 7 lines high; rays narrowly linear, 6 to 8 lines long.—Eldorado Co. foothills.

22. **S. neoméxicànus** Gray. Stem simple, erect, 9 to 18 in. high, ending above in a loose or compact cyme, the leaves mostly basal; herbage white-tomentulose or partly glabrate; basal leaves elliptic, dentate, 1 to 1½ in. long, narrowed below to a petiole 1 to 2 times as long; cauline leaves few, narrower, sessile by a broad base, sometimes more deeply toothed; heads 4 lines high, several to many in the cyme; rays 12 to 16, 4 to 5 lines long; achenes hispidulous or glabrous.—San Bernardino Mts.; e. to N. Mex.

23. **S. ìonophýllus** Greene. Stems several, erect, arising from a branched or simple root-crown, densely leafy below, mostly naked above the middle, 8 to 16 in. high; herbage floccose-woolly when young, soon glabrate; leaves orbicular, cordate or truncate at base, crenate to subentire, or sometimes with 1 or 2 small pairs of lobes at base, somewhat fleshy, 4 to 10 lines wide; petioles ¾ to 2 in. long; heads 6 to 8 lines high, borne in a loose terminal cyme or sometimes solitary; involucres broadly campanulate, 3½ to 4½ lines high, sometimes a little calyculate and a little white-tomentose at base; bracts lanceolate; rays showy, light yellow; achenes glabrous, 10-nerved, the alternate ones much stronger.—Mts. of S. Cal., 5700 to 7000 ft.: Tehachapi Mts.; San Gabriel Mts.; San Bernardino Mts. June. Var. BERNARDÌNUS Hall. Stems several from the root-crown, 6 to 12 in. high;

herbage with subpersistent tomentum; leaves crowded in basal tufts, orbicular to obovate, 3 to 5-toothed at apex, 3 to 7 lines long; petioles ¾ to 1¾ in. long.—San Bernardino Mts., 7000 ft. (S. bernardinus Greene.) Var. SPARSILOBÀTUS Hall. Stems slender, few from the root-crown, erect or ascending 6 to 11 in. high; herbage tomentose or green and glabrate; leaves mostly in basal tufts or the stems a little leafy to the middle, ½ to 1¼ in. long, pinnatifid into 5 obovate or roundish segments, the segments dentate at apex, the terminal one the largest; petioles about 1 to 3 times as long as the blades; sometimes with some leaves merely roundish and dentate; heads 4 to 5½ lines high; rays sometimes none.—San Bernardino Mts., 6000 to 10,000 ft. July-Aug. (S. sparsilobatus Parish.) Var. STŸGIUS Jepson n. comb. Related to var. sparsilobatus; stems 12 to 22 in. high; herbage soon very glabrous except for a few scattered persistent flocs; heads smaller (3 lines high).—New York Mts., e. Mohave Desert; e. to Ariz. (S. stygius Greene.)

24. **S. eurycéphalus** T. & G. Stems 1 or several, arising from the crown of stout taproot, erect, 1 to 2¾ ft. high, the leaves mostly basal or the cauline ones mostly scattered and commonly smaller; herbage floccose-woolly when young, more or less glabrate; leaves 2 to 7 in. long (on petioles ¼ to as long), deeply pinnatifid into 2 to 4 or 5 pairs of lobes or segments, the lobes obovate or cuneate-obovate, entire, coarsely serrate or incisely cleft, or the terminal portion not segmented and usually much larger; heads 5 to 6 lines high, few to numerous in a terminal corymb; involucres broadly campanulate, somewhat contracted above, their bracts linear or linear-oblong, somewhat acute, scarious-margined; rays 7 to 12, 5 to 6 lines long.—Open woods in the hills or rocky slopes in the mts., 1500 to 5000 ft.: Coast Ranges from Sonoma, Napa and Lake Cos. to Siskiyou Co. May-June. Var. ÁUSTINAE Jepson n. comb. Leaves more finely divided and incised, especially the terminal segment.—Modoc Co. (A. austinae Greene.)

25. **S. brèweri** Davy. Similar to S. eurycephalus; herbage glabrous; leaves with 1 to 9 pairs of segments, the segments often more incised, sometimes petiolulate.—South Coast Ranges from Santa Clara Co. to the San Emigdio Range; Tehachapi Mts.; Greenhorn Range.

26. **S. bolánderi** Gray. Stems slender, ½ to 2½ ft. high, arising from rootstocks; herbage glabrous; basal leaves cordate-orbicular or subcordate, crenate or crenate-incised, sometimes shallowly palmately lobed, ½ to 1½ in. long, sometimes with a pair of supplementary lobes on the petiole, the petioles 1½ to 3½ in. long; cauline leaves pinnately divided into about 5 mostly distinct leaflets, the leaflets serrate or shortly incised, the terminal one much the larger; cymes terminal, loose, 2 to 6-headed; heads 4 to 5 lines high; rays 5 to 8 (or 11), elliptic or oblong, 4 to 6 lines long.—Sandstone ridges near the coast, 100 to 500 ft.: Mendocino Co. to Del Norte Co.; n. to Ore.

27. **S. pauciflòrus** Pursh. Stem simple, erect, arising from the crown of a vertical root, 5 to 19 in. high, the leaves chiefly basal, those of the stem remote, mostly reduced above; herbage early glabrate; basal and lower leaves oval, crenulate or sometimes entire, ½ to 1¾ in. long; petioles 1 to 3 in. long; cauline leaves 1 to 3 in. long, oblong or linear, incised or pinnatifid to the sessile base or more or less petioled, sometimes subentire; heads about 4 lines high, few in a close terminal cyme, discoid; achenes glabrous.—Alpine, 9000 to 10,300 ft.: Sierra Nevada from Tuolumne Co. to Lassen Peak; n. to Alas., e. to Lab. and Quebec. (S. lemberti Greene.) Var. FÁLLAX Greenm. Similar to the species; heads radiate, the rays 4 to 7, about 3½ lines long.—High montane, Sierra Nevada from Tulare Co. to Mt. Dana. Var. CRÒCEUS Jepson n. comb. Stem 5 to 12 in. high; stem leaves pinnatifid and often much incised at the broad sessile base; rays saffron yellow.—Mt. Goddard to Mariposa Co., 8300 to 10,000 ft. (S. aureus var. croceus Gray.) Var. SUBNÙDUS Jepson n. comb. Stems nearly naked; basal leaves roundish to oval, the cauline less serrate or incised; rays 8 to 17.—Alpine, 8700 to 10,300 ft.: Mariposa Co. to Plumas and Lassen Cos.: n. to Wash. and Mont. (S. aureus var. subnudus Gray.) Var. JUCÚNDULUS Jepson n. var. Stems erect, arising from a branched rootstock, ending above in a compact cyme, 2 ft.

high, nearly naked, the leaves mostly basal; herbage quite glabrate or sparsely floeculent; leaves very erect, oblong-ovate, regularly serrate, cordate or subcordate at base, obtuse, ½ to 2½ in. long, the petioles 1½ to 5¾ in. long; heads 2½ to 3 in. high; involucre campanulate; rays 9, elliptic, 1½ to 2 lines long.—Montane, 8500 ft.: Tulare Co. (Volcano Creek, Jepson 4944, type).

28. **S. californicus** DC. Stem simple or branched from near the base, erect or diffuse, 7 to 17 in. high; herbage glabrous or the leaves obscurely soft-hairy; leaves linear or lanceolate, entire or pinnately (and shortly) lobed or pinnatifid, 1 to 2½ in. long, the upper ones strongly auriculate-clasping by a broad base; heads 4 lines high, several to many in loose terminal corymbs; involucres broadly hemispheric, nearly naked at base, the bracts brown-tipped; rays 14 to 20; achenes canescent.—Hill slopes, in chaparral, or sand dunes along the coast, 10 to 1500 ft.: Tulare Co. foothills; Santa Barbara Co. to San Diego Co.; w. side Colorado Desert; s. to L. Cal.

29. **S. mohavensis** Gray. Stem branching, 3 to 15 in. high; herbage glabrous; leaves obovate or broadly oblong to ovate, ¾ to 3½ in. long, irregularly dentate or shallowly lobed, often purple beneath, broadly auriculate-clasping or the lowest on petioles 6 to 9 lines long; heads 3 to 4 lines high, loosely cymose-paniculate; bracts of the involucre 11 to 15, linear, naked at tip or penicillate, not black-tipped; calyculate bracts few, minute; rays commonly none; achenes canescent.—Desert cañons or flats, 100 to 3000 ft.: Panamint Mts.; Colorado Desert. Apr.

1012. Senecio vulgaris L.; *a*, fl. branchlet x 1; *b*, lower leaf x ½.

30. **S. vulgaris** L. Common Groundsel. Fig. 1012. Stem simple or branching, 6 to 12 in. high; herbage glabrous or with a little loose tomentum; leaves pinnatifid with jagged margin; heads in terminal corymbs, disposed to be sessile in clusters; involucres cylindrical, 4 lines long, consisting of about 20 equal black-tipped bracts with several to many conspicuously black-tipped small ones at base; achenes slightly hairy.—Nat. weed from Eur., very common in waste places. Sometimes called "Old Man of Spring." The herbage is reputed poisonous to some animals. Feb.-Apr.

31. **S. sylvaticus** L. Stem branching from or near the base, erect, 1 to 3¼ ft. high; herbage pubescent; leaves linear to oblong in outline, 6 to 12 lines long, sessile or the lower with short winged petioles, pinnatifid with the lobes 1 or 2-toothed; corymbs loose, few-headed; heads cylindric; bracts of involucre not black-tipped, the small ones at base wanting or minute; rays about 5, minute, recurved, or sometimes wanting; achenes appressed-pubescent.—Woods of Mendocino and Humboldt Cos.; nat. from Eur.

32. **S. aphanactis** Greene. Very similar to no. 31; stems 4 to 7 in. high; herbage glabrous or slightly tomentulose on the heads or in the axils; involucre slightly constricted above.—Coastal region from sw. Solano Co. and the South Coast Ranges to San Diego.

33. **S. mikanioides** Otto. German Ivy. Stems twining and thus climbing over shrubs and trees to a height of 5 to 20 ft.; leaves ivy-like, roundish-cordate, sharply 5 to 7-angled; petioles as long or longer; stipules reniform, present except on the uppermost leaves; corymbs more or less paniculate;

heads linear-oblong, 5 to 7 lines long, the involucre about ½ the length of the corollas.—Nat. from S. Afr. along streams or gullies near the coast: Berkeley; Temescal Creek; Mills College; San Luis Obispo. Jan.

153. ÁRNICA L.

Perennial montane herbs, somewhat glandular or aromatic. Stems bearing 1 to several large heads at the summit. Leaves all opposite or the upper alternate. Involucre broadly campanulate, not calyculate at base; bracts lanceolate, equal, somewhat in 2 ranks. Disk-flowers many, yellow; ray-flowers pistillate when present, yellow. Achenes slender and somewhat spindle-shaped, with a callus knob at base. Pappus a single row of rather rigid and strongly roughened denticulate white bristles. (Origin of name obscure.)

Rays wanting (rarely some rudiments).
- Basal leaves mostly cordate at base, or merely truncatish, some of the cauline leaves usually petioled.
  - Involucre 4 to 5 (or 6) lines high; heads about 20 to 25-flowered; achenes glandular, not pubescent ..... 1. *A. parviflora.*
  - Involucre (5 or) 6 to 7 lines high; heads 30 to 50-flowered; achenes pubescent.. 2. *A. discoidea.*
- Basal leaves not cordate; cauline leaves sessile; involucre 4 lines high, 25 to 30-flowered; achenes glandular-hirsute ..... 3. *A. viscosa.*

Rays present (rarely wanting).
- Basal leaves mostly cordate at base.
  - Lower cauline leaves deeply cordate, long-petioled; achenes more or less hirsute.. 4. *A. cordifolia.*
  - Cauline leaves not cordate, sessile; achenes pubescent..... 5. *A. latifolia.*
- Basal leaves not cordate.
  - Plants leafy to the top or commonly so; cauline leaves seldom less than 4 pairs, the upper usually not conspicuously diminished.
    - Leaves oblong or oblong-lanceolate, the uppermost broad at base..... 6. *A. mollis.*
    - Leaves lanceolate, tapering at both ends or at base, the lower connate at base into a sheath.
      - Sheaths all herbaceous or nearly so; none or few of the stem leaves tapering to petioles; herbage minutely puberulent; stems few or several in a tuft from a branched root-crown..... 7. *A. longifolia.*
      - Sheaths membranous on each side below the point of union of the leafy bases; some of the stem leaves petioled; herbage tomentose-pubescent; stems one in a place, arising from a slender horizontal rootstock ..... 8. *A. foliosa.*
  - Plants less leafy; cauline leaves in 1 or 2 (rarely 3) pairs, the upper mostly small.
    - Herbage puberulent; stems 6 to 12 in. high; leaves mostly round-ovate or broadly ovate ..... 9. *A. nevadensis.*
    - Herbage villous-pubescent or puberulent; stems 8 to 20 in. high; leaves mostly lanceolate ..... 10. *A. alpina.*

1. **A. parviflòra** Gray. Stem slender, erect, 1½ to 2 ft. high, bearing a panicle of few to many heads, or the heads sometimes solitary; herbage puberulent, only slightly glandular; basal leaves ovate, varying to roundish or oblong, irregularly toothed, the larger obtuse or mostly truncate at base, rarely subcordate, 1 to 3½ in. long; petioles as long or 1½ times as long as the blade; cauline leaves few and reduced, usually some of them petioled; heads 20 to 30-flowered, 5 to 8 lines high; achenes minutely glandular, not pubescent or with only a few scattered hairs.—Hill slopes, 800 to 4000 ft.: w. Glenn Co. to Humboldt, Trinity and Del Norte Cos.

2. **A. discoìdea** Benth. Coast Arnica. Plants erect, 1½ to 2½ ft. high; herbage glandular or viscid-pubescent especially above; leaves broadly ovate or oblong, irregularly and often coarsely dentate, rounded or truncate or cordate at base, 2½ to 4 in. long, on petioles nearly as long or longer; cauline leaves sessile, reduced, often with salient teeth, the upper sometimes alternate; heads 8 to 10 lines high; rays none; involucres villous-glandular; achenes sparsely hispidulous, 2 to 3 lines long.—Dry open woods, 1500 to 6000 ft.: Coast Ranges from San Luis Obispo Co. to Humboldt Co.; Mariposa Co.; n. to Wash.

3. **A. viscòsa** Gray. Stems fastigiately branching, 8 to 12 in. high; herbage very viscid-pubescent; leaves small, ovate-oblong, entire, closely sessile, but not connate at base, 6 to 12 lines long; heads 25 to 30-flowered; involucre 4 lines high; corolla pale yellow; achenes glandular-hirsute with scattered hairs.—Mt. Shasta, 8000 ft.; very rare and too little known.

4. **A. cordifòlia** Hook. Stem erect, ½ to 2 ft. high, from slender creeping rootstocks; herbage pubescent or towards the heads somewhat villous; basal and lower cauline leaves cordate (some almost reniform, some merely ovate), 1 to 3 in. long, on petioles 1 to 2 in. long; uppermost leaves smaller, broadly lanceolate, mostly sessile; heads few in a loose cyme and long-peduncled, or in the alpine plants solitary, ¾ in. high; involucres hemispheric; rays 7 to 13, ¾ to 1 in. long.—Montane, mostly in open woods, 4300 to 10,000 ft.: Cuyamaca Mts.; Sierra Nevada from Tulare Co. to Modoc Co.; Santa Lucia Mts.; Mt. Hamilton; Humboldt Co. to Siskiyou Co.; n. to B. C., e. to Col.

5. **A. latifòlia** Boug. var. **viscídula** Gray. Stems erect, 9 to 14 in. high; herbage seemingly glabrous but minutely puberulent and sometimes a little glandular; leaves roundish ovate to ovate-oblong or ovate-lanceolate, mostly acute, denticulate or serrate, the basal on petioles ½ to 2 in. long, the cauline in 3 or 4 pairs on short (1 to 6 lines long) petioles, the uppermost sessile; heads 7 to 9 lines high; rays 6 to 8 lines long; achenes with short scattered slightly spreading hispid hairs.—Montane, 5000 to 6000 ft.: Mariposa Co. to Nevada Co.; Siskiyou Co. July.

6. **A. mòllis** Hook. Plants erect, 7 to 22 in. high, the stems few or several from a stout rootstock; herbage villous-pubescent to nearly glabrous, the inflorescence glandular-puberulent; leaves oblong to oblong-lanceolate, denticulate or dentate, acute or obtuse, 1½ to 3½ in. long, tapering into a margined petiole about ¼ to ½ as long or subsessile, or the basal with petioles as long; upper leaves broad at base, lanceolate to ovate-lanceolate, somewhat clasping; heads 5 to 6 lines high, in a loose cyme; rays 5 to 8 lines long; achenes hirsute-pubescent.—Montane flats, 8000 to 10,300 ft.: Sierra Nevada from Tulare Co. to Nevada Co.; n. to B. C., e. to Quebec and Col. Var. SCABÉRRIMA Smiley. Herbage scabrid; leaves more or less saliently toothed.—Tulare and Eldorado Cos.; w. Siskiyou Co. (A. scaberrima Greene.)

7. **A. longifòlia** Eat. Stems few or several from the root-crown, erect, 1 to 2¼ ft. high; herbage scantily puberulent; leaves elongated-lanceolate, tapering to both ends, entire or denticulate, somewhat nervose, 3 to 6 in. long, the lower connate-sheathing at base, the sheaths (⅛ or) ½ to 1 in. long; heads 2 to 4 in a corymb, the peduncles 1 to 3½ in. long; achenes with very minute and short glandular processes, not at all hairy or obscurely so.—Montane valleys or cañons, 5000 to 7200 ft., infrequent: Kern Co. to Nevada and Modoc Cos.; e. to Utah. July.

8. **A. foliòsa** Nutt. var. **incàna** Gray. Stems erect, strict, usually 1 in a place, from slender running rootstocks, 10 to 28 in. high; herbage tomentose-pubescent; leaves broadly lanceolate, denticulate, nervose, 2 to 5½ in. long, tapering to petioles, ½ to 1½ in. long or the upper clasping; lower leaves with sheathing bases, the sheaths ¼ to 1 in. long; heads 3 or 4 in a cyme, rarely solitary, the peduncles 1 to 1¾ in. long; bracts of the involucre acuminate; rays 4 to 6 lines long; achenes sparingly hairy.—Montane cañon flats or meadows, often standing in shallow water of lakes or the beds of former pools, 7800 to 9000 ft.: Sierra Nevada from Tulare Co. to Shasta and Lassen Cos.; n. to Wash. It passes into the next variety. Var. SÒNNEI Jepson n. comb. Stems and petioles long-villous; leaves mostly basal or subbasal.—E. Eldorado and Nevada Cos.; n. Lake Co. (A. sonnei Greene.) Var. BERNARDÌNA Jepson n. comb. Bracts of the involucre obtuse.—San Bernardino Mts. (A. bernardina Greene.)

9. **A. nevadénsis** Gray. Stems erect from slender rootstocks, 6 to 12 in. high; herbage puberulent, sometimes cinereous; leaves orbicular to broadly oval or ovate, mostly obtuse, entire, rarely denticulate, 1 to 2¼ in. long, mostly abruptly petioled, the petiole usually margined, ½ to 1¼ in. long; heads 7 lines high; rays 6 lines long; achenes minutely pubescent with short scattered and spreading slightly glandular hairs, or glabrate.—Montane, 5000 to 7600 ft.: Inyo and Mariposa Cos. to Modoc Co. July.

10. **A. alpìna** Olin. Stems erect, simple, 9 to 20 in. high, the heads terminal and solitary (rarely 2 or 3); herbage villous-pubescent or puberulent; leaves

1013. Peucephyllum schottii Gray; *a*, leaf x 1; *b*, fl. branchlet x ½; *c*, fl. x 2½.

narrowly oblong to lanceolate, or the basal ovate and the small uppermost ones linear, entire or denticulate, 3-nerved, ¾ to 2¾ in. long, narrowed at base to a petiole ½ to 2 in. long, the cauline often distinctly connate at base; achenes hirsute-pubescent, rarely glabrate. — Montane, 6000 to 9000 ft.: Mariposa Co. to Lassen Co.; n. Humboldt Co.; n. to Alas., e. to Lab.; n. Eur.

154. **PEUCEPHÝLLUM** Gray

Balsamic shrub, the numerous ultimate branchlets fastigiate and crowded with leaves up to the single discoid head. Leaves terete, resinous-punctate. Involucre broadly campanulate, its bracts numerous, linear-subulate, in about 2 series. Flowers yellowish. Corolla with very short proper tube and long cylindric throat, its short teeth erect, puberulent. Achenes turbinate-oblong, densely hirsute. Pappus shorter than the corolla, its bristles numerous, unequal, rather sordid, roughish, some of the longer with narrow hyaline margins. (Greek peuke, the fir, and phyllon, leaf, on account of the needle-like foliage.)

1. **P. schóttii** Gray. Fig. 1013. PIGMY CEDAR. Glabrous very much branched shrub 3 to 9 ft. high; leaves 3 to 5 (or 10) lines long; heads 5 to 6 lines high; corolla-teeth purplish in age.—Washes of the foothills and gravelly sides of cañons: Inyo Co.; Mohave Desert; Colorado Desert; e. to Ariz., s. to L. Cal.

155. **LÉPIDOSPÁRTUM** Gray

Ours a rigid broom-like shrub. Leaves alternate, all but the earliest reduced to scales. Bracts of the involucre regularly imbricated in 3 or 4 series, chartaceous, oblong, obtuse. Receptacle naked. Heads discoid. Flowers pale yellow. Corolla with long slender tube, the short campanulate throat exceeded by the spreading lobes. Anthers exserted. Achenes terete, faintly 8 to 10-nerved. Pappus of copious minutely scabrous capillary bristles. (Greek lepis, scale, and sparton, the broom shrub.)

1. **L. squamàtum** Gray. Fig. 1014. Round-topped bush 3 to 6 ft. high; young or basal shoots white-tomentose, densely leafy with obovate entire leaves, 4 to 6 lines long; full-grown plant glabrate, or with flocs of wool in the axils, its stems ascending or virgate, with scattered ovate-acute

1014. Lepidospartum squamatum Gray; *a*, leafy shoot, spring growth, x ½; *b*, fl. branchlet x ¼; *c*, head x 1; *d*, fl. x 1½; *e*, pappus-bristle x 3.

scales ½ to 1½ lines long; heads 3 to 6 lines high, racemose or paniculate, 11 to 13-flowered; involucre campanulate; achenes glabrous or nearly so.—Sandy washes and gravelly plains, 1000 to 3000 ft.: cismontane S. Cal. and n. to southern Monterey Co., the upper San Joaquin Valley and the southern Sierra Nevada in Kern Co.; Mohave and Colorado deserts; e. to Ariz., s. to L. Cal. Var. OBTÉCTUM Jepson n. var. Peduncles beneath the heads very densely imbricated with small scales.—Whitewater Wash (Schellenger, type).

156. **TETRADÝMIA** DC.

Low rigid shrubs of arid regions. Herbage whitish tomentose, sometimes almost glabrate. Leaves alternate, entire, solitary or fascicled, the primary ones often replaced by spines. Involucre cylindric to oblong, its bracts 4 to 6, firm, concave, overlapping, often enlarged and thickened at base. Heads discoid, 4 to 9-flowered. Receptacle flat, small. Flowers yellow. Achenes terete, short, faintly 5-nerved. Pappus white or whitish, of fine and soft scabrous capillary bristles. (Greek tetra, four, and dymos, together, the first-known species with four-flowered heads.)

Achenes glabrous, or with hairs much shorter than those of the pappus; pappus extremely copious.
- Heads 4-flowered; branches not spiny.
  - Leaves permanently tomentose, 6 to 10 lines long ..... 1. *T. canescens.*
  - Axillary leaves glabrate, 3 to 5 lines long ..... 2. *T. glabrata.*
- Heads 5-flowered; branches slender, spiny ..... 3. *T. stenolepis.*

Achenes heavily and densely clothed with long ascending hairs which quite conceal the pappus; pappus-bristles reduced to a single series.
- Heads peduncled, scattered or loosely racemose ..... 4. *T. spinosa.*
- Heads nearly sessile in a close terminal cyme ..... 5. *T. comosa.*

1. **T. canéscens** DC. Fig. 1015. Stems freely branching, diffuse or decumbent, 4 to 12 in. long, unarmed; leaves and inflorescence white with a permanent close tomentum; leaves somewhat crowded but rarely at all fascicled, linear or oblanceolate, pungently acute, 6 to 10 lines long; heads short-pedunculate in cymose clusters terminating the short branchlets; involucres 4 to 5 lines high, 4-flowered, their bracts 4 or 5, oblong, carinate; achenes quite glabrous to villous; pappus sordid or yellowish. — Sandy and rocky hillsides and plains, 4000 to 7000 ft.: San Luis Obispo Co. to the San Gabriel and San Bernardino mountains; e. side of the Sierra Nevada and its easterly plateau crests; Siskiyou and Modoc Cos.; n. to B. C., e. to Wyo. and N. Mex. Var. INÉRMIS Gray. Leaves and involucres shorter. — San Luis Obispo; Honey Lake Valley; e. to Rocky Mts.

1015. Tetradymia canescens DC.; *a*, fl. branchlet x ½; *b*, fl. x 1½, showing the pappus-bristles crinkled at the middle.

2. **T. glabràta** Gray. Stems branching to form a rounded bush 1 to 2½ ft. high; herbage white-tomentose, the leaves soon glabrate; primary leaves rigid-subulate, cuspidate, 3 to 5 lines long, early deciduous; axillary leaves 3 to 6 in a fascicle, linear-oblanceolate, soft, persistent, 3 to 5 lines long; leaves of sterile shoots linear-subulate, appressed, without fascicled ones in their axils; heads in terminal cymes, or the cymose clusters sometimes racemosely disposed; involucres 3½ to 4½ lines high, white-tomentose or glabrate and green, 4-flowered; bracts 4 or 5, oblong, carinate; achenes densely hairy; pappus sordid.—Mohave Desert and n. along the e.

side of the Sierra Nevada to Ore., e. to Utah. The young buds and leaves are more or less poisonous to sheep.

3. **T. stenólepis** Greene. Shrub 1¾ to 2¾ ft. high; herbage permanently white-tomentose with appressed wool; lower primary leaves oblanceolate, mucronate, about 10 lines long; upper primary leaves modified into rigid spreading spines 1 to 1⅝ in. long; secondary fascicled leaves oblanceolate, 5 to 11 lines long, or entirely wanting; heads in close terminal cymes; involucres 5 lines high, 5-flowered, their bracts 5, linear-oblong, very thick and rigid, obtuse; achenes canescent but glabrate; pappus comparatively coarse, its bristles bent at tip.—Western and central Mohave Desert north to the s. Sierra Nevada and Inyo Co.

1016. Tetradymia spinosa H. & A.; fl. branchlet x ⅔.

4. **T. spinòsa** H. & A. Cotton Thorn. Fig. 1016. Rigidly branched silvery-tomentose shrub 2 to 4 ft. high; primary leaves modified into rigid spines and bearing in their axils the second year a cluster of secondary leaves and 1 (rarely 2 or 3) peduncles; spines slender, often needle-like, straight or recurved, tomentose or glabrate, ¼ to 1½ in. long; fascicled leaves linear-clavate, glabrous or early glabrate, 3 to 5 lines long; peduncles 1-headed; involucres about 4 lines high, usually 6 or 7-flowered; bracts 5 or 6, varying from linear-oblong (the outer) to elliptic (the inner), all obtuse; achenes with soft white hairs nearly equaling the rigid pappus-bristles.—Desert areas, 2000 to 4000 ft.: Mohave Desert and its bordering mountain slopes; Inyo Co.; n. to eastern Ore., e. to Utah and Ariz.

5. **T. comòsa** Gray. Bush with many erect stems and virgate branches, 2 to 4 ft. high; herbage permanently and densely white-tomentose; leaves narrowly linear, soft, 1 to 1½ in. long, the uppermost ones rigid, somewhat spine-like, 7 to 9 lines long; heads in close terminal cymes; involucres 4 to 5 lines high, 6 to 9-flowered; bracts 5 or 6, oblong, obtuse; long straight but soft hairs of the achene very abundant, concealing the true pappus.—Low dry hills: cismontane S. Cal.; Mohave Desert; e. to Nev.

Tribe 12. **Cynàreae.** Thistle Tribe

Thistles or thistle-like herbs with alternate prickly leaves. Heads large. Bracts of the involucre imbricated, usually prolonged into a spine or bristle, or provided with a membranous edge. Receptacle bristly or hairy. Flowers all perfect. Rays none. Corollas tubular, cleft into long narrow lobes. Anthers long-tailed at the base, with elongated appendages at the tip. Pappus bristly or plumose, rarely paleaceous.

157. **CNÌCUS** L.

Annual herb. Leaves pinnatifid or mostly sinuate-dentate with spiny or prickly teeth. Heads solitary at the ends of the branches, subtended and almost concealed by the upper leaves. Bracts of the involucre imbricated in several series, the outer ovate and tipped by a simple spine, the inner lanceolate and ending in a strong pinnately branched spine. Flowers yellow. Achenes many-nerved, 10-toothed at the summit, and bearing a pappus of awns in 2 series; outer series long, naked, yellow; inner series hispidulous, white. (Latin name of the Safflower, applied to thistles.)

1. **C. benedíctus** L. Blessed Thistle. Stem freely branching, 1 to 2 ft. high; herbage pubescent; leaves oblong or oblong-lanceolate, thin, upper clasping, lower petioled; heads 1 in. long.—Nat. from Eur. on valley floors: Petaluma; Lathrop; Buena Vista, Nevada Co.; Oroville. Mar.-June.

CARTHÁMUS L. Flowers yellow. Outer bracts of the involucre terminating in a foliaceous appendage; inner bracts more rigid, appressed, ending in a spinescent tip. Achenes obpyramidal, with a crenulate margin at the truncate summit. Pappus-paleae of 2 kinds, the outer unequal, ciliate, in several series, the inner in one series and much shorter; or pappus quite wanting in the outer row of achenes. C. LANÀTUS DC. Distaff Thistle. Annual, 10 to 25 in. high; leaves rigid, prickly pinnatifid, clasping.—Native of Mediterranean region, adv. at San Francisco and Stockton.

158. SÌLYBUM Gaertn.

Annual or biennial herb. Leaves very ample, sinuate-pinnatifid, prickly, clasping, smooth and shining above and very conspicuously blotched with white along the veins. Heads very large, solitary at the ends of the branches. Flowers purple. Corollas with filiform tube conspicuously dilated below the narrowly linear lobes. Bracts of the involucre broad, appressed, bearing an abruptly spreading spine which is broadly lanceolate or ovate and ciliate-prickly toward the base. Pappus-bristles in several series, flattish, minutely barbellate. (Old Greek name applied to thistle-like plants.)

1. **S. marianum** Gaertn. MILK THISTLE. Branching, 3 to 6 ft. high; leaves $1\frac{1}{2}$ to $2\frac{1}{2}$ ft. long, 6 to 12 in. wide, strongly undulate at the sinuses; heads about 2 to $2\frac{1}{2}$ in. broad; spines of the middle involucral bracts 1 to $1\frac{1}{2}$ in. long.—Nat. from the Mediterranean region, common in abandoned fields, old pastures and by roadsides throughout Cal. May-Aug.

159. CỲNARA Vaill.

Stout perennial herb. Leaves ample, pinnatifid or bipinnatifid. Flowers blue. Heads very large, globose, solitary on the ends of the branches. Bracts of the involucre broadly ovate, obtuse or emarginate, coriaceous. Receptacle fleshy, fimbrillate. Pappus of many series of plumose bristles. Achenes obovate, somewhat 4-angled. (From the Greek kuon, a dog, the spines of the involucre being likened to a dog's teeth.)

1. **C. cardúnculus** L. CARDOON. Stem freely and diffusely branching, $1\frac{1}{2}$ to $2\frac{1}{2}$ ft. high; stems and under side of leaves white-tomentulose, the upper side of leaves green, thinly arachnoid; leaves bipinnatifid, 1 to 2 ft. long, the lobes and teeth bearing long spines; involucres $1\frac{1}{4}$ to $1\frac{3}{4}$ in. high, the bracts spinose.—Native of s. Eur., nat. at Benicia and Cordelia; a garden escape at San Bernardino.

C. SCÒLYMUS L. Artichoke. Leaf lobes scarcely spinose; inner bracts of involucre with scarious tips, not spinose.—Garden plant from Eur., an occasional escape.

160. CÍRSIUM Scop. THISTLE

Stout biennial or perennial herbs. Leaves alternate, prickly or spiny, commonly toothed or pinnatifid. Heads with numerous crimson, white or yellowish flowers, perfect and all alike, or unisexual in C. arvense. Corolla tubular, its segments linear. Involucre spherical to campanulate, ovoid or cylindrical, its bracts imbricated in many ranks, at least the outer tipped with a spine or prickle, rarely innocuous. Receptacle thickly clothed with soft bristles or hairs. Achenes obovate or oblong, compressed, not ribbed, smooth and glabrous. Pappus of a single series of bristles, plumose or barbellate to the middle, clavellate-dilated at tip, united into a ring at the base and deciduous as a whole. (Kirsion, Greek name of a kind of thistle.)

A. HEADS CONSISTING WHOLLY OF PERFECT FLOWERS; BIENNIALS (EXCEPTING NOS. 9 AND 16).

1. Heads leafy-bracteate (the spiny foliaceous bracts usually more than 3), commonly more or less clustered.

Stem spinose-winged by decurrent leaf-bases; upper surface of leaves strigose-setulose with harsh hairs; involucral bracts and leaves linear . . . . . 1. *C. lanceolatum.*

Stem not spinose-winged (although leaf-bases may be somewhat decurrent); upper surface of leaves never strigose-setulose with harsh hairs.

Leaves and stem glandular; involucral bracts dilated and slightly fimbriate above the middle; heads a little nodding . . . . . 2. *C. fontinale.*

Leaves and stem not glandular.
Outer and middle series of involucral bracts pinnately spinose.
Leaves whitish, felt-like, with broad obtuse lobes and few small spines; foliaceous bracts ¾ to 2 in. long, felt-like; seacoast..3. *C. maritimum.*
Leaves at length green, thinner (thickish in no. 5), with numerous spines; foliaceous bracts ½ to 1 in. long, not felt-like.
Heads mostly arachnoid-woolly; seacoast, mid. Cal.....4. *C. andrewsii.*
Heads essentially glabrous; lower San Joaquin.....5. *C. crassicaule.*
Outer and middle series of involucral bracts entire; leaves and foliaceous bracts green, usually thin, with numerous weak prickles; stem hollow, weak, succulent; woods along streams.....6. *C. edule*

2. Heads naked, or if leafy-bracteate, the foliaceous bracts 1 to 3 (rarely more).

Involucral bracts, especially the outer, conspicuously spinose-fimbriate.
Involucres broadly turbinate; involucral bracts lanceolate, few, mostly thin and loose..
7. *C. remotifolium.*
Involucres campanulate; involucral bracts mostly dilated above the middle, numerous, the outer ones oblong, imbricated.....8. *C. americanum.*
Involucral bracts entire or sometimes minutely spinulose.
Plants ½ to 1 (or 3 in var. of no. 9) ft. high; upper leaves often longer than the heads; heads solitary or in pairs, 1 to 2½ in. high; involucres essentially glabrous; bracts 3 to 12 lines long, tipped with a spine or cuspidate or blunt.
Heads peduncled; stem leafy.
Outer bracts brownish red with a yellow margin and base, coriaceous, cuspidate or not; leaves broad.....9. *C. quercetorum.*
Outer bracts without a prominent yellow margin, chartaceous, prickle-tipped; leaves narrower.....10. *C. drummondii.*
Heads sessile on the ground or very shortly peduncled; leaves mostly in a basal rosette, longer than the heads.....11. *C. acaulescens.*
Plants 1 to 6 ft. tall; upper leaves never longer than the heads; involucres floccose or woolly (sparingly in no. 17).
Heads mostly paniculately clustered, rarely solitary or in pairs.
Leaves and bracts mostly thin and glabrate; spines weak.....12. *C. vaseyi.*
Leaves mostly thick and tomentose.
Bracts abruptly tipped with a spine of equal length; heads numerous, 6 to 12 lines high; bracts 1 to 3 lines long....13. *C. breweri.*
Bracts gradually attenuate into a spine of unequal length; heads not so numerous, clustered or sometimes not, larger; bracts (2 or) 3 to 9 lines long.....14. *C. mohavense.*
Heads solitary on very long peduncles, rarely in clusters of 2.
Flowers white, lavender or pink; heads 1 to 1½ in. high; plants rather slender, 1½ to 6 ft. tall; stems grayish.
Bracts tending to reflex; spines 1 to 4 lines long; common.....
15. *C. californicum.*
Bracts straight; spines 5 to 9 lines long; Mt. Whitney.....
16. *C. ochrocentrum.*
Flowers bright red, crimson or purple; heads 1½ to 2½ in. high; plants 1 to 3 ft. tall.
Bracts erect, mostly glabrous, cuspidate or not; plants slender; stems reddish .....17. *C. andersonii.*
Lower bracts tending to reflex, floccose (sometimes glabrate), spine-tipped; plants mostly stout; stems grayish..18. *C. occidentale.*

B. HEADS UNISEXUAL, 4 TO 9 (OR 12) LINES HIGH; TIPS OF INNER INVOLUCRAL BRACTS REFLEXED; PERENNIAL.....19. *C. arvense.*

1. **C. lanceolàtum** (L.) Scop. BULL THISTLE. Spreading, 2 to 3½ ft. high: herbage green; leaves lanceolate, 1½ to 8 (or 14) in. long, deeply pinnatifid into lanceolate lobes, the callous midribs and veins excurrent as rigid spines, the base decurrent on the stem into interrupted prickly wings, the upper surface strigose-setulose, the lower tomentose; heads large, 1½ to 2 in. high, terminating leafy branchlets; involucral bracts lanceolate, attenuate into slender rigid prickly-pointed spreading tips, lightly arachnoid; corollas rose-purple. Nat. from Eur., common at lower altitudes: Berkeley; Stockton; Suisun; Ione; Quincy; Prattville; Eureka; Yreka.

2. **C. fontinàle** (Greene) Jepson. Plants 1 to 2 ft. high, the branches widely spreading; stems and upper surface of leaves more or less glandular-pubescent; heads ¾ to 1 in. high, mostly clustered, a little nodding; bracts of the involucre very broad, almost 3 lines in width from the base to the abruptly acute apex, fimbriate-dilated and spreading or recurved from near the middle, prickle-pointed; corollas dull white; anther-tips acute.—Crystal Sprs., San Mateo Co. Perhaps introduced. June. (Cnicus fontinalis Greene.)

3. **C. marítimum** Jepson n. comb. Stems succulent, leafy to the top, branched so as to form a rounded bushy plant 1 to 3 ft. high; leaves covered

with a dense heavy felt-like tomentum, the stems merely arachnoid; basal leaves 3 in. long, elliptical in outline, sinuately and undulately pinnatifid, the lobes broad, overlapping, the spines few, short (½ to 2 lines long) and for the most part borne only at the ends of the lobes; petiole margined, 2 in. long; cauline leaves more spinose, auriculate-clasping; heads 1¼ to 1¾ in. high, borne in a terminal leafy-bracteate cyme; bracts straight, lanceolate, tapering into a long spine, spinose-ciliate above the middle; corolla-segments about as long as the throat; anther-tips acute.—Surf, Santa Barbara Co. (Carduus maritimus Elmer.)

4. **C. andrèwsii** (Gray) Jepson. Stems tall, striate, cymosely branching at summit, 3 to 4 ft. high; tomentum usually deciduous except from the heads and under surface of the leaves; basal leaves oblong, 5 to 16 in. long, deeply sinuate-pinnatifid into 3-cleft lobes, the lobes spinulose-bordered and terminating in a stout spine; petiole prickly-margined, about 4 in. long; upper leaves laciniate-pinnatifid, the lobes lanceolate, terminating in long spines; heads hemispherical, somewhat clustered, sessile or shortly peduncled; involucres arachnoid-woolly, becoming flocculent, 9 to 11 lines high; proper bracts with coriaceous oblong-ovate base, the short upper part greenish and abruptly contracted into an awn-like spine, often somewhat pinnately spinose; leafy bracts pinnately spinose and strongly spinose-tipped; corollas bright red, the segments longer than the throat.—Coves and marshes near the sea, Marin and Sonoma Cos. June-July.

5. **C. crassicáule** (Greene) Jepson. Stem 3 to 4 ft. high, very stout below, hollow, striate, branching above, and bearing a panicle of 6 to 9 subsessile or short-peduncled heads; herbage in the mature plant arachnoid-pubescent, the under surface of the leaves white-tomentulose; leaves similar to those of no. 7; involucres campanulate, glabrous in age, 7 to 9 lines high; proper bracts linear-lanceolate to lanceolate-acuminate, tipped with a rather long slender prickle, often pinnately spinose above the middle, the lower portion entire or finely ciliate; leafy bracts with a few strong prickles or pectinate-spinescent, the inner sometimes passing into the proper bracts; corollas whitish or pinkish, the segments about as long as the throat. — Low fields of the San Joaquin River in San Joaquin Co. May. Possibly it is not a native.

6. **C. édule** Nutt. Fig. 1017. INDIAN THISTLE. Stem simple, robust but tender and succulent, 3½ to 6 ft. high, pubescent and leafy to the top; leaves thin, white-tomentose below, the basal narrowly oblong to oblanceolate, sinuate-pinnatifid, very prickly-ciliate, 8 to 10 in. long, the cauline similar, auriculate-clasping; heads depressed-globose, 1 in. high, few in a terminal cluster, leafy-bracted at base; involucres conspicuously arachnoid-woolly when young, sometimes tending to become glabrate in age, 9 to 14 lines high; outermost bracts foliaceous, pinnately spinose, the proper involucral bracts lanceolate-subulate, spinose-tipped; corollas dull purple, pink or whitish, the segments shorter than the throat and with callous thickening at apex; pappus fuscous.—Creeks and gulches, 50 to 1500 ft., common: coastal S. Cal.; Coast Ranges; n. to B. C.

1017. Cirsium edule Nutt.; *a*, leaf x ½; *b*, fl stem x ½; *c*, achene and pappus x 1.

7. **C. remòtifòlium** (Hook.) Jepson. Stem 2 to 5 ft. high, openly

cymose-branched, the branches few, slender, terminated by usually solitary heads; herbage nearly glabrate, loosely arachnoid or minutely flocculent; leaves oblong to lanceolate, spinulose, 2 to 7 in. long, pinnately lobed to divided, the divisions of at least the lower divergently 2 or 3-lobed; under surface of the leaves white-tomentulose; heads mostly on long (2 to 7 in.) peduncles, the peduncles naked or the leaves much reduced and remote; involucres broadly turbinate to campanulate, lightly arachnoid and glabrate, 8 to 12 lines high; bracts linear or elongated-subulate, more or less fimbriolate, the inner mostly entire except at the crisped apex; corollas yellowish white, the segments shorter than the throat; pappus of coarse bristles, the strongest with club-shaped tips.—Dry mountain ridges, 3000 to 5000 ft.: Lake and Mendocino Cos. to Humboldt Co.; n. to Wash. It intergrades to no. 9. (Carduus remotifolius Hook.) Var. RIVULÀRE Jepson n. var. Basal leaves oblong, sinuately lobed or pinnatifid, the cauline lanceolate, entire, remotely spinulose-margined, auriculate-clasping; flowers purple.—Along streams in open woods, e. Humboldt Co., 3000 ft. (near Low Gap, J. P. Tracy 2909, type).

8. **C. americànum** Daniels. Stem simple or branched above, ¾ to 2½ ft. high; herbage glabrate and green or the leaves tomentose below; leaves oblong to oblanceolate, spinose, sinuately toothed to deeply pinnatifid, 1½ to 9 in. long, the upper auriculate-clasping, the lower tapering to a spinose-margined petiole; heads campanulate or sub-globose, solitary or in terminal clusters of 2 or 3; involucres 9 to 10 lines high, imbricated; outer and middle bracts oblong, the margin mostly spiny-toothed and tipped with 1 to 3 curved spines; inner bracts lanceolate with barely spinose scarious tips; corolla yellowish, the lobes shorter than the throat.—Sonoma Co. to Siskiyou Co. May-July. (Cnicus americanus Gray.) It passes into: Var. CALLÍLEPIS Jepson n. comb. Bracts dilated at apex, the dilated portion with a fimbriate-scarious margin and a short terminal spine, the lower portion of the bracts mostly entire-margined.—San Francisco; Berkeley; Marin Co. July. (Carduus callilepis Greene.)

1018. Cirsium quercetorum Jepson; *a*, habit x ⅛; *b*, bract of involucre x 1; *c*, fl. x ¾.

9. **C. quercetòrum** (Gray) Jepson. Fig. 1018. BROWNIE THISTLE. Plants perennial by horizontal rootstocks; stem short, erect, 4 to 6 (rarely 12) in. high, its few branches each bearing a large head; herbage arachnoid-tomentose when young, especially on the under surface of the leaves, eventually glabrate; leaves oblong in outline, 3 to 9 in. long, pinnately parted or divided, the oblong or lanceolate divisions often 3 to 5-cleft or -divided, strongly or weakly prickly, mostly narrowed below to a petiole; involucres campanulate, 1 to 1½ in. high; involucral bracts thickish, coriaceous, entire or sometimes minutely fimbriate, closely imbricated in many ranks, light or dark brown and often with a straw-color border, the outermost ovate (about 3 to 5 lines long), the inner becoming lanceolate and twice or thrice as long, all with a short cusp rather less than 1 line long or sometimes blunt; innermost bracts obscurely scarious at tip; corollas purplish or whitish, 4 of the lobes united higher, the others longer than the throat.—Open hills, or valley flats, 50 to 1500 ft.: Mendocino Co. to San Benito Co. Var. WÁLKERIÀNUM Jepson n. comb. Plants taller (1 to 3 ft. high); heads on long (3 to 7 in.) peduncles.—Humboldt Co.; Berkeley. (C. walkerianum Petrak.)

10. **C. drummóndii** T. & G. Stem simple, erect, 2 to 12 in. high; heads somewhat tomentose or glabrous, the leaves arachnoid-tomentose beneath; leaves oblong or oblanceolate, 3 to 12 in. long, deeply sinuate-pinnatifid, the lobes spinulose to nearly entire; heads 1 to 1¾ in. high; involucral bracts chartaceous, the outer ovate with acute short-spinose tips, the inner lanceolate with weak scarious tips, the tips varying from entire and acute to dilated and fimbriate; corollas white or rose-purple, long-exserted, the lobes not longer than the throat; anthers very acuminate.—Montane, 2500 to 6600 ft.: mts. of S. Cal.; Mt. Pinos; Sierra Nevada; Siskiyou Co.; e. to Col. June-July.

11. **C. acauléscens** (Gray) K. Schn. Heads 2 to several in a cluster seated on the ground and subtended by the rosette of basal leaves or sometimes borne terminally on a stem 1 or 2 in. high; herbage tomentulose to glabrate, the under surface of the leaves sometimes whitish-arachnoid; leaves lanceolate or narrowly oblong, 2 to 8 in. long, toothed to pinnatifid, the margin or lobes armed with short or long prickles; heads 1 to 2 in. high; bracts oblong-lanceolate to lanceolate, tipped with a short spine, or the inner ones weak-spined; corollas similar to no. 12.—Montane, 5300 to 8500 ft.: mts. of coastal S. Cal.; Sierra Nevada from Tulare Co. to Eldorado, Sierra and Modoc Cos. June-July. (Cnicus drummondii var. acaulescens Gray.)

12. **C. váseyi** Jepson n. comb. Stem simple or branched above, leafy, 1 to 3 ft. high; herbage thinly tomentose to glabrate; leaves lanceolate to narrowly oblong, 2½ to 7 in. long, pinnately cleft into remote segments, these again more or less deeply cleft, the ultimate segments with rather long stout spines; upper leaves decurrent; heads terminating rather short branches, either in pairs or paniculately clustered; involucres greenish, ¾ to 1 in. high, the proper bracts lanceolate, with spreading short-spinose tips, and often with a viscid ridge on the back; corolla-segments shorter than throat.—Dry or woody hillsides, 2000 to 4500 ft.: Siskiyou, Modoc and Butte Cos. May-July. (Cnicus breweri var. vaseyi Gray.) Var. HYDRÓPHILUM Jepson n. comb. Lower leaves as much as 12 in. long and 5 in. broad; heads paniculately clustered; glandular spot on bracts more pronounced.—Wet places: Mt. Tamalpais; Suisun. (Carduus hydrophilus Greene.)

13. **C. brèweri** Jepson. SWAMP THISTLE. Stem slender, simple below, paniculately branched above, 3 to 8 ft. high, the heads numerous and often borne in dense clusters; herbage commonly white-tomentose, sometimes nearly green; lower leaves rather narrowly oblong, 6 to 14 (or 22) in. long, spinose-dentate to sinuate-pinnatifid, with rather broad lateral segments and elongated terminal segment tipped with a long or short spine; upper leaves mostly elongated-lanceolate, conspicuously prickly, 2½ to 6 in. long; heads short-cylindric, markedly constricted about the middle, 8 to 12 lines high; involucres subglobose, 4 to 9 lines high, the bracts much appressed, firm-coriaceous, bearing towards the apex a dark colored area and a glandular or viscid spot or ridge; outer and middle bracts ovate to oblong-lanceolate, abruptly tipped with a spreading weak prickle; inner bracts lanceolate, mostly with a soft or crisped tip; corollas pale purple, pink or whitish, the lobes shorter than the throat; anther-tips deltoid, merely acute.—Swamps or wet places, 2500 to 5000 ft.: North Coast Ranges; Butte Co. to Modoc Co.; n. to Ore. July-Aug.

14. **C. mohavénse** Petrak. DESERT THISTLE. Stem rather stout, 2 to 4 ft. high, ending above in a panicle bearing clustered heads or the heads in a loose cyme on long peduncles; herbage white-tomentose or the tomentum deciduous above; lower leaves oblong in outline, 6 to 14 in. long, sinuate-pinnatifid, the lobes tipped with long yellow spines; petioles very short or long; upper leaves shorter, decurrent, all densely prickly; heads ½ to 1¼ in. high; involucres glabrate; bracts straw-color, the spines yellow, as long as the body of the bracts, often spreading or reflexed; corollas pinkish or reddish.—Alkaline meadows about springs, 2000 to 6000 ft.: Colorado and Mohave deserts; Inyo Co. June-July. (Carduus mohavensis Greene.)

15. **C. californícum** Gray. Fig. 1019. SIERRA THISTLE. Stem slender, 2 (or 3) to 6 ft. high, leafy toward the base, cymosely branched above, the heads

1019. Cirsium californicum Gray; *a*, basal leaf x ⅛; *b*, fl. branchlet x ⅛; *c*, bract of involucre x 1.

bosely branched above, the peduncles leafy and heads usually solitary; herbage mostly thinly tomentose to glabrate; basal leaves narrowly oblong, 5 to 12 in. long, pinnately cleft or parted into rather remote segments, these again cleft into triangular lobes armed with long stout yellow spines, at base tapering into a spinose-margined petiole; cauline leaves shorter with a spinose-auriculate-clasping base; heads campanulate, 1½ to 1¾ in. high; involucres 1¼ in. high, with foliaceous bracts pinnately spinose at base, the proper bracts ovate to lanceolate, entire, with or without a viscid line on the back, tipped with a stout somewhat spreading spine often twice as long as the body; innermost bracts attenuate to a short weak spine; corollas purple, the lobes much longer than the throat.—Mt. Whitney, 10,000 to 11,500 ft. Aug.

17. **C. andersònii** Petrak. Stem slender, reddish, simple or sparsely branched, nearly naked above, 1 to 3 ft. high, the heads 1 or few, corymbose or racemose, on peduncles 1½ to 9 in. long; herbage loosely woolly to glabrate; leaves oblong to lanceolate, 4 to 8¼ in. long, spinose-toothed to deeply pinnatifid with spinulose, toothed or cleft lobes, solitary on long (5 to 13 in. long) peduncles; herbage white-woolly, the wool more or less deciduous; leaves linear, narrowly oblong or lanceolate, 1 to 8 in. long, sinuately toothed to deeply and angularly pinnatifid, moderately prickly; heads 1 to 1¾ in. high; involucres hemispherical, glabrate to somewhat woolly, 4 to 12 lines high; bracts narrowly lanceolate, coriaceous at base, the upper portion spreading and often incurved, the terminal prickle short; corollas cream-color, white or rarely purple, the lobes equaling or shorter than the throat; anther-tips deltoid. — Chaparral or openly wooded slopes, 1500 to 7500 ft.: Sierra Nevada from Placer Co. to Tulare Co.; South Coast Ranges; mts. of coastal S. Cal.; n. to Santa Lucia Mts. (Cnicus lilacinus Greene.) Var. BERNARDÌNUM (Gray) Petrak. Not so tall; leaves often sparsely spiny; involucres globose-depressed, spines of bracts weak and inconspicuous.—Hillsides, S. Cal., 1000 to 4000 ft. Apr.-June. (Carduus bernardinus Greene.)

16. **C. ochrocéntrum** Gray. Stem leafy, branched, 1 to 2 (or 6) ft. high, arising from a perennial root, corym-

1020. Cirsium occidentale var. coulteri Jep son; *a*, fl. branch x ⅓; *b*, basal leaf x ⅛.

the base broad or narrow and more or less spinose-auriculate; heads broadly turbinate, 1½ to 2 in. high; involucres broadly turbinate, glabrous, 1¼ to 1¾ in. high; outermost bracts foliaceous, pinnately spinose; proper bracts lanceolate-subulate, acuminate, tipped with a short spine, or the innermost merely long-acuminate; corollas rose-purple, the segments nearly as long as the throat; styles long-exserted.—Montane, 4000 to 9000 ft.: Sierra Nevada from Tulare Co. to Butte Co.; e. to Nev., n. to Ida. June-Aug. (Cnicus andersonii Gray.)

18. **C. occidentàle** (Nutt.) Jepson. Stem stout, branched, 1½ to 3 ft. high; herbage mostly white with a coating of cottony wool, the upper side of the leaves greenish and merely thin-tomentulose; leaves lanceolate to oblong, 2 to 10 in. long, sinuate-dentate to pinnatifid, prickly, or sometimes the prickles few and weak; heads subglobose, 1½ to 2 in. high; involucral bracts subulate-lanceolate, straight, with short spines, not widely spreading, densely festooned with cobwebby hairs; corollas reddish or purple, the segments longer than the throat; anther-tips narrow and acuminate; pappus rather scanty.—Sand dunes or sandy hills along the coast from Mendocino Co. and San Francisco to San Diego; also interior valleys and hills of Coast Ranges and coastal S. Cal. Apr.-July. This seacoast species passes by intergrades into the first variety. Var. CÒULTERI Jepson n. comb. Fig. 1020. Stem stout, erect, 2 to 4 ft. high, ending above in a few long cymose branches bearing single long heads; heads mostly subglobose; involucres arachnoid-woolly to glabrate, their bracts gradually narrowed into a slender spine; outer bracts appressed at base, then spreading, the upper portion either incurved or straight or deflexed; innermost bracts erect; corollas red, white or lavender.—Dry warm montane slopes, 2500 to 8000 ft.: n. Los Angeles Co.; Coast Ranges; Sierra Nevada; e. to Nev. May-July. (C. coulteri Harv. & Gray.) Var. VENÚSTUM Jepson n. comb. Fig. 1021. Similar to var. coulteri but the heads campanulate or even tending slightly to cylindric and noticeably constricted at the middle; involucres not woolly, merely thinly tomentulose or arachnoid; corolla bright crimson.—Dry hill and mountain slopes, 500 to 2000 ft.: middle and inner North Coast Ranges. (Carduus venustus Greene.) Var. CANDIDÍSSIMUM Mcbr. Stem very stout; herbage almost snowy white with a commonly persistent felt-like tomentum; outer and middle involucral bracts rigid, at length squarrose-spreading or reflexed, heavily festooned with wool; corollas crimson.—Dry slopes, 400 to 5300 ft.: Mendocino, Siskiyou and Modoc Cos.; e. to Nev. (Carduus candidissimus Greene.)

1021. Cirsium occidentale var. venustum Jepson; *a*, basal leaf x ⅓; *b*, fl. branchlet x ½.

19. **C. arvénse** Scop. CANADA THISTLE. Stem slender, 1 to 3 ft. high, arising from creeping perennial rootstocks and thus forming patches, above paniculately branched and bearing mostly close clusters of heads at the ends of the branches; herbage arachnoid-pubescent to glabrate; leaves lanceolate or oblong in outline, 1 to 5 in. long, pinnatifid and with spinose-toothed segments; heads numerous, 6 to 11 lines high, unisexual, the staminate and pistillate usually on different plants; staminate heads ovate-globular, the flowers well exserted; pistillate heads oblong-campanulate, the flowers less exserted, with only abortive anthers; corollas rose-purple; involucral

bracts appressed, the outer ½ to 2 lines long, the inner longer, all with small weak prickles.—Nat. from Eur.: lower Eel River at Ferndale; Yreka; Quincy; Truckee; Los Angeles, San Bernardino and Orange Cos.

161. ÁRCTIUM L. Burdock

Coarse biennial herbs. Leaves very large, broad, petioled. Flowers purple, rarely white, in rather large solitary or clustered heads. Involucre globular, its bracts numerous, imbricated, rigid, lanceolate, appressed at base but attenuate into long spreading spines hooked at tip. Receptacle densely bristly. Achenes oblong or narrowly ovate, flattened, ribbed, transversely wrinkled. Pappus short, of many serrulate bristles, deciduous. (Greek arktos, a bear, from the rough involucre.)

Heads somewhat racemose, arachnoid; involucres 6 to 9 lines broad.....1. *A. minus.*
Heads somewhat corymbose, glabrous; involucres 11 to 13 lines broad.....2. *A. lappa.*

1. **A. minus** Benth. Common Burdock. Coarse biennial weed; herbage more or less scurfy or thinly tomentulose; stems erect, leafy, several ft. high; leaves broadly ovate to cordate-reniform, somewhat toothed or sinuate, the lower 1 to 1½ ft. long, the upper 2 to 4½ in. long; heads broadly ovate or globose, ¾ in. high; involucral bracts hooked at the tip, cobwebby-tomentose; flowers purple; pappus short, of numerous rough bristles.—Bottom lands of the Eel River near Humboldt Bay; introduced from Eur.

2. **A. lappa** L. Great Burdock. Plants 3 to 5 ft. high; leaves as in A. minus, tomentulose below, glabrous above; heads somewhat corymbose; involucral bracts glabrous.—Native of Eur., sparingly introduced near the coast: Livermore; Niles; Aromas, San Benito Co.; Carmel Valley.

162. CENTAURÈA L. Star Thistle

Erect or diffuse usually rigid herbs. Leaves alternate, not prickly. Heads medium-sized. Involucre ovoid, globose or campanulate, the bracts imbricated and ending in a needle-like prickle, or at least a fringed or toothed (rarely entire) appendage. Receptacle densely bristly, the bristles persistent. Flowers yellow, purple or blue, all tubular, the marginal much larger and neutral. Pappus of 2 or 3 rows of bristles or short scales or none. (Named for one of the Centaurs who used it in healing.)

1022. Centaurea melitensis L.; *a*, fl. branchlet x ½; *b*, leaf x ½; *c*, achene and pappus x 3½.

Achenes notched just above the base, indicating the oblique or lateral attachment.
Flowers yellow; leaves decurrent on the stem; bracts of the involucre spiny; achenes light gray; pappus present.
Plants erect, branching mostly above the base; spines 2 to 4 lines long. 1. *C. melitensis.*
Plants diffuse, branching from the base; spines ½ to 1 in. long..... 2. *C. solstitialis.*
Flowers purple or blue; leaves not decurrent.
Middle bracts ending in a very stout spine; achenes brown; pappus none.....3. *C. calcitrapa.*
Bracts fimbriate, devoid of spine; pappus red.....4. *C. cyanus.*
Achenes not notched, attached basally; flowers blue; bracts of the involucre not spiny; pappus-bristles many.....5. *C. repens.*

1. **C. melitensis** L. Napa Thistle. Tocalote. Fig. 1022. Erect commonly much-branched annual 1 to 2 ft. high, with a roughish indument, the stems winged by the decurrent leaves; lowest leaves pinnatifid, the upper narrow and mostly entire; heads mostly terminal and solitary, or 2 or 3 together, ½ in. high; bracts rigid, the outer with palmatifid spine, the intermediate and inner ones with a rigid spine 2 to 4 lines long, which

is either simple or with divaricate short spines at base; flowers yellow; pappus-bristles in about 3 rows, the middle row long, the outer and inner very short.—Nat. from Eur., abundant everywhere in agricultural lands and pastured hills. First introduced at Napa and diffused over the state in seed grain, hence commonly known as Napa Thistle. It is one of our most widespread and objectionable grain-field weeds. May-June.

1023. Centaurea solstitialis L.; *a*, fl. branchlet x ½; *b*, achene and pappus x 3; *c*, fl. x 1.

2. **C. sólstitiàlis** L. Yellow Star Thistle. Barnaby's Thistle. Fig. 1023. Diffuse annual branching from the base, 1 ft. high, cottony-pubescent; basal leaves pinnatifid, the cauline linear, entire, rather closely ascending, decurrent into long narrow wings; heads solitary at the ends of the branches, ovoid-globular; spines of the intermediate bracts 6 to 10 lines long; innermost bracts ending in a small shining appendage; flowers very bright yellow; achenes with pappus.—Cultivated fields, roadsides and waste lands, nat. from Eur.: Sacramento Valley; North Coast Ranges; Alameda Co.; San Diego. An objectionable alien, its aggressive spread continued steadily since 1885.

3. **C. calcítrapa** L. Purple Star Thistle. Coarse and rigid perennial, forming dense bushy plants 2 to 4 ft. high, nearly glabrous; leaves pinnately divided into few linear or lanceolate lobes, or the uppermost undivided, all serrulate, not decurrent; heads large, 9 to 10 lines high, on short peduncles scattered along the branches, or in the forks, or terminal; involucral spines very stout, ½ to 1 in. long; flowers purple; achenes brownish, over 1 line long, destitute of pappus.—Nat. from Eur. in uncultivated lands: plains of Solano Co.; San Mateo.

C. salmántica L. Escobilla. Leaves sinuately divided into triangular lobes below the large terminal ovate- or oblong-lanceolate lobe, not decurrent; heads on long slender peduncles; involucral bracts ovate, obtuse, not spine-tipped, the innermost with lanceolate scarious appendage; flowers purple; achenes brown; pappus white.—Native of Eur., adv. at Healdsburg.

4. **C. cỹanus** L. Bluebottle. Erect annual 1 to 2 ft. high, lightly flocculent-tomentose when young; leaves linear, entire or the lower rarely dentate or pinnatifid; heads 1 in. high, terminating naked peduncles; involucres campanulate, 7 lines high, their bracts with a scarious fimbriate border; flowers deep blue; marginal corollas much enlarged, ray-like; pappus-bristles unequal.—Nat. from Eur.: Scott Valley, Siskiyou Co.; Holmes Flat, Eel River; Oakland; Los Angeles; Orange Co.

5. **C. rèpens** L. Turkestan Thistle. Stems 1 to 3 ft. high from creeping perennial rootstocks; herbage arachnoid or at base white-tomentose; basal leaves oblong, sinuately lobed or pinnatifid, 1¼ to 3 in. long, gradually narrowed to a petiole about ½ as long; cauline leaves linear, entire, ¾ to 1¼ in. long; heads solitary on the ends of the leafy branchlets, oblong or short-cylindric, 6 to 6½ lines high; bracts of the involucre orbicular, strongly scarious-margined on upper third, shortly acute, the innermost with acuminate hairy tips; pappus-bristles many in a single series, barbellulate.—Native of Asia, introduced about 1918: Greenville, Orange Co.; Arlington, w. Riverside Co.; Artesia, Los Angeles Co.; Helm, Fresno Co.; Tuttle, Merced Co.; Norman, Glenn Co. Also called Russian Knapweed.

SUPPLEMENT

P. 68. **Triglòchin palústris** L. Scapes very slender, ¾ to 1½ ft. high; sepals 6; fruit linear or clavate, composed of 3 carpels.—Montane: Rattlesnake Creek, Kern Cañon, 8500 ft. (F. W. Peirson).

P. 330. **Euròtia lanàta** (Pursh) Moq. Also called Lamb's Tail.

P. 380. **Aconìtum howéllii** Nels. & Mcbr. Stem slender, weak, 2 to 3 ft. long; leaves 1½ to 2½ in. wide, deeply parted into 4 or 5 lobes, the lobes laciniately cleft or toothed; axils of the leaves bearing bulblets; flowers pale blue; follicles 5 to 5½ lines long.—Siskiyou Co. (Etna Mills, J. P. Young); n. to Ore.

P. 457. **Peltiphyllum peltàtum** (Torr.) Engler. Indian Rhubarb.

P. 583. **Lathỳrus littoràlis** (Nutt.) Endl. Monterey.

P. 594. **Euphorbiàceae. Tràgia** L. Perennial herbs. Stems slender, wiry, beset with stinging hairs. Leaves small, coarsely toothed, short-petioled. Flowers monoecious, in small clusters at the ends of the branches. Staminate flower: sepals 3 to 5; stamens 3 to 5. Pistillate flower: sepals 5; ovary with one ovule in each cell. **T. ramòsa** Torr. Stems hirsute; stamens 4 or 5.—Providence Mts. (P. E. Munz); e. to Mo. and Tex.

P. 626. **Malvàceae. Abùtilon** Gaertn. Perennial herbs with cordate leaves and axillary flowers. Calyx without bracts. Stigmas capitate. Carpels 5 to 10, leathery, dehiscent, 2 to several-seeded. **A. párvulum** Gray. Stems slender, prostrate or ascending.—Providence Mts. (P. E. Munz); e. to Tex., s. to Mex.

P. 647. **Viòla langsdórffii** Fisch. This species does not occur in Cal. The plants so referred above belong to V. palustris L. (acc. M. S. Baker).

P. 892. **Solànum villòsum** Lam. Stem erect, branching, 8 to 15 in. high, short-villous; calyx glandular-pubescent; corolla yellowish, 1½ lines long; filaments triangular-dilated, slightly joined at base; ovary glabrous; style slightly puberulent.—Naturalized near Los Angeles: Arcadia; Bellflower. The herbage is poisonous to chickens when fed with alfalfa greens.

P. 901. 2. **Linària vulgàris** Mill. Butter-and-Eggs. Perennial; stem erect, 1 to 2½ ft. high; leaves linear, very numerous; flowers yellow in a terminal dense raceme; corolla (including the slender spur) 1 in. long.—Nat. from e. U. S.: Pt. Reyes; Valley Ford; Wawona (Thos. Howell); Emerald Bay, Lake Tahoe.

P. 1079. **Wyéthia ovàta** T. & G. var. **funérea** Jepson n. var. Herbage not tomentose, rather densely covered with short gland-tipped hairs; leaves shorter and broader than in the species, 4 to 10 in. long, 2 to 5 in. wide, mostly rather coarsely few-toothed.—Funeral Mts., Death Valley (Jepson 6903, type).

Jepson, Manual, pp. 961-1170, Nov. 24, 1925.

MAJOR GEOGRAPHIC TERMS[1]

Cismontane California, all the area west of the main sierran crest.

Cismontane Southern California, the area west of the main sierran crest.

Coast Ranges, the complex of ranges west of the Great Valley. See North Coast Ranges, etc.

Colorado Desert in California, includes the desert area between the San Jacinto and Cuyamaca mountains on the west, the Colorado River on the east and the Mohave Desert on the north.

Conchilla Desert, the northwest arm of the Colorado Desert.

Conchilla Mts., the range extending from Morongo Pass to Pleasant Valley, bounding the Conchilla Desert on the north.

Great Valley, the great central valley of California, lying between the Sierra Nevada and Coast Ranges.

Hoods Peak Range, the mountains west of Napa Valley.

Inner Coast Range, the range next to the Great Valley; it is composed of a number of distinct ranges with specific geographical names.

Inner North Coast Range, the range bounding the Sacramento Valley on the west (including the Vaca Mountains north to the Trinity Mountains).

Inner South Coast Range, the range bounding the San Joaquin Valley on the west (from Mt. Diablo south to Mt. San Emigdio).

Mayacamas Range, east of Ukiah Valley from Cobb Mt. and Geyser Peak northward to Cow Mt.

Mohave Desert in California, includes the desert area bounded by the Tehachapi Mountains and Inyo County on the north, the San Gabriel and San Bernardino mountains and Riverside County on the south and the Colorado River on the east.

North Coast Ranges, the ranges north of San Francisco Bay as far as the Siskiyous.

Sacramento Valley, north arm of the Great Valley.

San Carlos Range, the inner South Coast Range from Panoche Pass south to Waltham Creek.

San Joaquin Valley, south arm of the Great Valley.

Santa Barbara Islands, including all the islands off the Southern California coast.

Seaward or *Outer Coast Range,* the range next the ocean; applied more frequently to the seaward North Coast Range.

Sierra Nevada, the main mountain axis on the eastern side of the Great Valley, south to Tehachapi Pass and north to Pit River.

South Coast Ranges, the ranges south of San Francisco Bay as far as Santa Barbara County (Santa Maria River).

Southern California, a definitely defined portion of California, including the eight counties south of Tehachapi, namely, Santa Barbara, Ventura, San Bernardino, Los Angeles, Orange, Riverside, San Diego and Imperial; coastal Southern California, that portion west of the crest of the main sierran axis.

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1 Includes also some special designations not found on maps.

Acaulescent, apparently stemless, the leaves all borne at the surface of the ground and the flowers sessile or borne on a scape. (See Caulescent.)

Accessory, something additional.

Accrescent, increasing in size or length with age, as the calyx or pedicel after flowering.

Accumbent, said of cotyledons with edges lying against the caulicle.

Acerose, with a sharp slender point like a needle.

Achene, a dry indehiscent 1-seeded fruit.

Acorn, fruit of the Oak.

Acuminate, tapering gradually to the apex; taper-pointed.

Acute, with a sharp point.

Adherent, growing fast to or united with another body or organ of a different kind.

Adnate, growing fast to; literally, born united to another body.

Alternate leaves or branches, only one from each node.

Amplexicaul, said of a leaf with the base clasping the stem.

Anastomosing, the union of veins so as to form a network.

Anatropous, with the ovule inverted on its stalk.

Ancipital, two-edged.

Andro-dioecious, with staminate and with perfect flowers on different individuals.

Androgynous, having both staminate and pistillate flowers in the same cluster.

Andro-monoecious, with staminate and with perfect flowers on the same individual.

Annual, a plant flowering and fruiting in the first year or season and then dying.

Annular, having the form of a ring, ring-like.

Anterior, the side in front; in an axillary flower, the side away from the stem; lower; inferior.

Anther, the sac or sacs containing the pollen, the essential part of the stamen.

Anthesis, the period during which a flower is expanded, the stigma receptive and the anthers shedding pollen.

Antrorsely, directed forward.

Apetalous, without petals.

Aphyllopodic, without a leafy base.

Apiculate, ending in a short-pointed tip.

Appendage, any supplementary or superadded part.

Appressed, flattened or pressed against another body but not united with it; hairs lying flat on leaves are appressed.

Approximate, standing or borne close or near together.

Aquatic, living or growing in water; an "aquatic plant" may be wholly submersed or with only the base in water.

Arcuate, moderately curved.

Areola, an area with a distinct or raised boundary; the spaces between the reticulations or veins: in Compositae the disk or circle at the summit of the achene where sat the corolla; *areolate,* having areolae.

Areole, same as Areola.

Aril, an appendage of a seed growing at or about the hilum or summit of the funiculus; *arillate,* furnished with an aril.

Aristate, furnished with an arista or awn, like the beard or bristle of Barley.

Articulation, a joint; *articulated,* jointed or furnished with joints; where the stem or organ separates or is inclined to do so.

Ascending, rising gradually upwards.

Assurgent, rising or curving upwards from the base.

Attenuate, gradually narrowed or prolonged.

Auricled, with ear-like lobes at base; auriculate.

Awn, a bristle, like the beard of Barley.

Awned, provided with a bristle.

Axil, the angle between a leaf and stem.

Axile, referring to or borne on the axis.

Axillary, borne or occurring in an axil.

Axis, the stem or longitudinal or central support on which parts or organs are arranged; a central line.

Baccate, of the nature of a berry, berry-like or pulpy.

Banner, the upper petal in a papilionaceous, or pea, flower.

Barbate, bearded, the hairs directed upward.

Barbed, furnished with sharp rigid reflexed points, like the barbs of a fish-hook.

Barbellate, beset with short stiff hairs; *barbellulate,* the diminutive.

Berry, a fleshy indehiscent fruit, formed from a single superior or inferior ovary.

Bi-, a prefix to Latin words, two or twice.

Bifid, 2-cleft to the middle or thereabouts.

Bilabiate, a synsepalous calyx or sympetalous corolla cleft into two divisions, with an upper (superior or posterior) lip and a lower (inferior or anterior) lip; 2-lipped as the corolla of Sage or of Mimulus.

Bilamellate, of two plates or lamellae.

Bipinnate, twice pinnate.

Blade, the flat expanded portion of a leaf; said also of the broad portion of a petal, especially when it possesses a petiole-like base or claw.

Bloom, said when leaves and fruit are whitened with a fine powder or dust. (See Glaucous.)

Bract, the modified or much reduced leaf of a flower-cluster; in Gramineae, the modified leaf subtending a spikelet; leafy-bracted, in Compositae, with accessory or foliose bracts to the head outside the involucre.

Bracteate, possessing or bearing bracts.

Bractlet, the small modified leaf subtending a flower or inserted on the pedicel.

Bud, the youngest or formative portion at the end of a stem.

Bulb, cluster of fleshy storage leaves set closely on a short stem axis and forming an underground organ.

Bur, a fruit covered with prominent spines.

Caducous, dropping off very early as compared with othe parts; the calyx in the California Poppy falls when the flower opens.

Caespitose (or cespitose), said of stems and leaves when borne on the same stock in a close tuft.

Callous, hardened, indurated.

Callus, hardened and often smooth tissue or protuberances; the tough often hairy swelling at base of the lemma and palea in grasses.

Calyculate, said of the short bracts which occur at the base of the involucre proper in some Compositae and so imitate an exterior involucre.

Calyx, the outer, usually green, whorl of the flower.

Campanulate, bell-shaped.

Canescent, grayish white or hoary, the surface covered with fine white hairs.

Capillary, like a hair.

Capitate, gathered or collected into a head, or head-like.

Capsule, a dry dehiscent seed-vessel composed of more than one carpel.

Carinate, having a keel, sharp ridge, or carina.

Carpel, a simple pistil (which is typically 1-celled, with one placenta, one style, and one stigma), or one of the elements of a compound pistil; also applied to a simple pistil when mature or to one of the parts of a compound pistil which splits up when it is ripe. The number of carpels composing a compound pistil may be determined from the number of styles or stigmas, or, if these are blended, by the number of cells in the ovary, or, if but one cell, by the number of placentae.

Cartilaginous, firm and tough like cartilage.

Caruncle, an excrescence or process at the hilum in certain seeds.

Catkin, a scaly spike or ament, as in the Willow or Oak; in the Conifers applied to the staminate and ovulate clusters.

Caudate, bearing a slender tail-like body or appendage.

Caudex, a short stem or trunk, more commonly the persistent woody base of a perennial herb.

Caulescent, having a distinct leafy stem above ground; plants with radical leaves and flowers on a scape are called acaulescent.

Caulicle, the stem in an embryo.

Cauline, pertaining to or borne on a stem, as cauline leaves.

Chamisal, the formation composed of Chamise; see p. 503.

Chaparral, collective term referring to the colonies of thorny or rigid shrubs growing on mountain slopes. It is a xerophytic formation, composed of such species as Ceanothus cuneatus, sorediatus, spinosus and divaricatus, Pickeringia montana, Arctostaphylos viscida and glauca and Quercus dumosa.

Chartaceous, having the thickness or texture of writing paper; most leaves are chartaceous.

Choripetalous, petals distinct and free from each other; not united even at base.

Chorisepalous, sepals distinct and free from each other.

Ciliate, having the margin bordered with a row or rows of hairs; *ciliolate,* the diminutive.

Cinereous, of ashy hue.

Circinate, rolled into a coil from the tip.

Circumscissile, splitting at the middle with the upper part falling away like a lid.

Cismontane, this side of the mountains, that is west of the main sierran crests; a term used in opposition to or contrast with the deserts.

Clavate, narrow but widening gradually and regularly upward like a club, *clavellate,* the diminutive.

Claw, the narrow or petiole-like base of a petal.

Cleft, with sharp lobes, usually about to the middle.

Coalescent, said of united organs in one circle.

Cochleate, shell-shaped.

Coherent, united with another body or organ of the same kind.

Coma, a tuft of hairs; *comose,* furnished with a coma.

Commissure, the plane by which the flattened faces of the two carpels in Umbelliferae cohere.

Complete, said of a flower which has all the four circles, sepals, petals, stamens, and pistils.

Complicate, folded upon itself.

Compressed, flattened on the sides or laterally: compressed pod in Cruciferae, flattened parallel to the partition; compressed achenes in Compositae, flattened contrary to the plane of the bract; compressed fruit in Umbelliferae, flattened parallel to the plane of the commissure. (See Obcompressed.)

Concolorous, of one color.

Conduplicate, folded flat so that the folds or sides lie face to face.

Connate, united from the beginning (born united).

Connective, the portion of a stamen connecting the two cells of an anther.

Connivent, lightly joined or sticking.

Contorted, bent or twisted on itself or out of the usual position.

Convolute, rolled inwards from one side to the other.

Cordate, heart-shaped with the notch at the base.

Coriaceous, leathery in texture and stiffness.

Corm, a thickened or globose fleshy stem base, underground and sometimes called a solid bulb.

Corolla, the circle of petals in a flower, found outside the stamens and within the calyx.

Corymb, pedicels of unequal length, the lower longer so as to form a flat-topped cluster; *corymbose,* in corymbs.

Costate, ribbed.

Crenate, with rounded or blunt teeth; *crenulate,* the diminutive.

Crested, bearing a ridge or elevation on the summit of an organ.

Cruciferous, with the petals spreading in the form of a cross.

Crustaceous, shell-like.

Cucullate, hood-shaped, cowled.

Culm, the hollow stem of grasses.

Cuneate, widening gradually and regularly upwards from a pointed base; wedge-shaped.

Cuspidate, tipped with a cusp or short hard point.

Cyme, a flower cluster in which the terminal or central flower blooms first; *cymose,* after the manner of a cyme.

Deciduous, falling when ripe or after the function has been performed; a corolla is deciduous when it falls after anthesis; deciduous trees shed their leaves in autumn.

Declined, curved downward or forward.

Decompound, several times compounded.

Decumbent, lying on the ground but tending to rise at the end.

Decurrent, where the edge of the leaf runs down on the stem forming lines or wings.

Decussate, opposite but each pair placed at right angles or over the intervals of the pair above or below.

Deflexed, bent abruptly downward.

Deltoid, triangular with equal sides.

Dentate, toothed with the teeth standing directly outward.

Denticulate, dentate with fine teeth.

Dextrorse, turned towards the right hand.

Di-, a prefix to Greek words, two or twice.

Diadelphous, stamens united into two sets.

Dichotomous, branching or forking with the two divisions nearly equal.

Didymous, twin, found in pairs.

Didynamous, said of stamens in 2 pairs with one pair shorter than the other.

Digitate, parted or divided like the fingers of a hand.

Dilated, widened or broadened, applied to flattened or wing-like structures; *dilatation,* that which is dilated.

Dimorphic, having two unlike forms.

Dioecious, with stamens and pistils in different flowers on different plants.

Discoid, disk-like; without ray-flowers.

Discrete, separate, said of organs which are neither crowded nor remote.

Disk, a development of the receptacle at or around the base of the ovary; In Compositae, the tubular corollas of the receptacle as distinct from the ray.

Dissected, several times cleft into small segments.

Distichous, in 2 ranks or rows.

Distinct, parts in the same circle not united; as "stamens distinct," separate from each other.

Divaricate, widely divergent.

Divided, cleft about to the base, or to midrib.

Dorsal, relating to or borne along the back; lower; outer; posterior.

Drupe, a fruit with a fleshy or soft outside (or exocarp) and a hard or stony inside (or endocarp).

Elliptic, about 1½ times as long as broad; elliptical.

Emarginate, with a sharp notch at apex.

Emersed, growing up out of or raised above the water.

Endosperm, starch or other reserve food stored with the embryo in the seed.

Entire, margin not toothed or indented.

Epigynous, with the flower parts as if inserted on the summit of the ovary, that is the ovary wholly inferior.

Equilateral, equal sided, or with the same number of parts on a side; a pinnate leaf is equilateral when it has the same number of leaflets on each side of the rachis.

Equitant, astride, as if riding, like the leaves of Iris.

Erose, gnawed on the edge; *erosulate,* the diminutive.

Explanate, spreading out flat.

Exserted, protruding beyond the surrounding organ; exserted stamens protrude beyond the corolla; an exserted corolla protrudes beyond the calyx.

Exstipulate, without stipules.

Extrorse, turned outward.

Falcate, sickle-shaped.

Fascicle, a close cluster or bundle of roots, stems, leaves or flowers.

Fastigiate, with clustered parallel branches.

Favose, with honey-combed surface; *faveolate,* the diminutive.

Felt-like, with very densely and closely woven wool.

Fenestrate, with transparent areas or window-like openings.

Fertile flower, one containing a pistil capable of producing fruit with good seed; *fertile stamen,* the anther containing pollen.

-fid or -fidus, terminations meaning cleft or lobed; 3-fid means 3-cleft.

Filament, a thread, in case of a stamen the stalk supporting the anther.

Filiform, thread-like.

Fimbriate, fringed; *fimbrillate,* the diminutive.

Fistulous, hollow.

Flabellate, fan-shaped.

Flaccid, flabby or limp.

Flexuous, more or less zigzag.

Floccose, bearing locks or tufts of hair or wool.

Floret, a small flower, one of a cluster.

Foliaceous, leaf-like.

Foliolate, having leaflets; 3-foliolate, with 3 leaflets, etc.

Follicle, a dehiscent seed-vessel derived from a single carpel, as a pod of the Larkspur.

Foveate, pitted; *foveolate,* the diminutive.

Free, not united to another organ, especially when one circle of the flower is not united to another circle.

Fruit, the matured or ripened ovary with all its appendages or accessory parts as well as contents.

Fruticose, relating to a shrub; shrubby.

Fruticulose, diminutive of fruticose; relating to a little shrub, as Phyllodoce breweri.

Fugacious, very promptly falling off or lasting but a short time.

Fulvous, tawny.

Funicle, the stalk on which the ovule is borne in the ovary.

Fusiform, thickest at or above or below the middle and tapering more or less to each end.

Galea, the long or helmet-like upper lip in the Mint and Figwort families; *galeate,* having a galea.

Geminate, twin, in pairs, two side by side.

Geniculate, bent abruptly, like a knee.

Gibbous, swollen or distended on one side.

Glabrate, somewhat glabrous or becoming glabrous.

Glabrous, bald, not hairy. Some agriculturists and some botanists wrongly use the term smooth as opposite to hairy; bald or glabrous is the opposite of hairy; smooth is the opposite of rough. No word would be left as an antonym of rough, if smooth be perverted in this way from its right etymological use. Cf. Smooth.

Glandular, bearing glands, or having a surface which exudes a sticky or viscid liquid.

Glaucescent, somewhat glaucous or becoming so.

Glaucous, whitened with a bloom.

Globose, rounded, more or less spherical.

Glomerate, compacted into a close cluster.

Glomerule, a compacted or condensed head-like cyme.

Glumaceous, like the glume (bract) of grasses, thin but firm.

Glume, one of the two lowest bracts on the spikelet in grasses.

Glutinous, with a sticky exudation.

Granulate, bearing granules or grain-like bodies; *granuliferous.*

Gynaecandrous, having the pistillate and staminate flowers in the same spikelet, the former above the latter.

Gynobase, an elevation or process of the receptacle bearing the carpels or nutlets.

Gyno-dioecious, having flowers on one plant pistillate, on another perfect.

Gyno-monoecious, having perfect and pistillate flowers on the same plant.

Habit, mode of growth, general aspect or hue of a plant.

Halophyte, a plant growing in salty soils or alkaline soils, mostly succulent plants with thick or small leaves; the Pickleweed, Atriplex and Kern Greasewood are typical halophytes.

Hastate, with a pair of lobes at base turned outward.

Head, said of flowers in a globose cluster, being sessile and collected at the same point on the peduncle.

Herb, a plant without woody stem or parts, at least above ground.

Herbaceous, like an herb in appearance or habit, or in texture or color, as *herbaceous sepals,* meaning green or leaf-like.

Herbage, the vegetative parts (stems and leaves) produced in the season, not including the flowers or fruit.

Heteromorphic, having several different forms.

Hirsute, with long firm hairs; *hirsutulose, hirsutulous,* the diminutives.

Hispid, with stiff or rigid hairs.

Hispidulous, hispidulose, minutely hispid.

Hooded, said of an organ which is curved or concave at the top like a hood.

Hyaline, transparent, translucent.

Hydrophyte, a plant adapted to live in water or very wet soil, chiefly characterized by a thin epidermis, reduction or absence of roots and reduction of the vascular system as in the Pond Lilies, Pond Weeds and Duck Weeds, or by succulence as in Arrow Head, or by tall unbranched stems with narrowly linear leaves, or leafless as in the Bulrushes and Sedges.

Hypogynous, inserted on the receptacle, with the parts of the flower under or free from the pistil.

Imbricate, overlapping like the shingles on a roof so as to cover or break joints.

Immersed, growing wholly under water.

Incised, cleft or cut irregularly and sharply.

Included, not protruding beyond the surrounding organ; included stamens do not protrude beyond the corolla.

Incomplete, said of a flower which has not all of the four circles.

Incumbent, said of cotyledons when the back of one of them lies against the caulicle.

Indefinite, variable or uncertain in number, numerous.

Indehiscent, said of fruits or pods which do not split open.

Indigenous, native to the region.

Indument, with a close pubescence or coat of hairs.

Induplicate, with the tips turned in.

Indurated, hardened or becoming tough.

Inequilateral, not equilateral, which see.

Inferior, growing or placed below; inferior ovary, one more or less attached to or united with the calyx; inferior stamens or lip of corolla, that is with the stamens or lip on the lower side of the flower; see *Superior.*

Inflated, distended or bladdery.

Inflexed, bent or turned abruptly inward.

Inflorescence, a flower-cluster, or in particular the mode of arrangement of the flowers in a cluster.

Innate, borne on the apex.

Innovations, in Gramineae, barren shoots.

Inserted, attached to or growing upon.

Internode, the portion of the stem between two nodes.

Interrupted, not continuous and regular.

Introrse, turned inward.

Involucel, a secondary involucre, as that of an umbellet; a circle of bractlets.

Involucre, a circle of bracts subtending a flower cluster; *involucrate,* provided with an involucre.

Involute, rolled inwards from both sides.

Irregular, the parts not of the same size and shape.

Keel, a longitudinal central ridge on the back of an organ, like the keel of a boat; the two lower petals of a pea-like flower which are joined into a keel-like body.

Lacerate, irregularly but not necessarily deeply cleft or torn.

Laciniate, cut or slashed into narrow divisions.

Lamellate, composed of thin plates.

Lanate, densely and very closely woolly.

Lanceolate, 4 to 6 times as long as broad and tapering from slightly above base to apex.

Lax, loose.

Leaflet, one of the divisions of a compound leaf.

Legume, a 1-celled seed vessel, composed of a single carpel, which dehisces by both the ventral and the dorsal sutures into two valves.

Lemma, the lowest bract of the floret in grasses; see p. 72.

Lenticular, shaped like a lens.

Ligneous, hard and woody.

Ligule, like a short ribbon or strap, such as the ray in the Sunflower Family; in Gramineae the exserted portion of the hyaline membrane lining the sheath; *ligulate,* provided with a ligule.

Limb, a border, the blade of a petal or the spreading part of a sympetalous corolla.

Line, $\frac{1}{12}$ of an inch.

Linear, very narrow, with parallel sides; 4 or 5 or more times as long as wide.

Lip, one of the two divisions of a 2-lipped corolla or calyx. (See Bilabiate.)

Littoral, growing near or under the influence of the sea.

Lobe, a division of an organ, especially one which is rounded; leaf lobes are usually not deep; leaves may be lobed, parted or divided depending upon the depth of division. (See Parted and Divided.)

Loculicidal, a capsule splitting longitudinally into the backs of the cells.

Lodicule, in Gramineae, one of 2 or 3 minute hyaline scale-like organs at the base of the stamens, whose function is the opening of the floral envelope at anthesis.

Lunate, crescent-shaped.

Lyrate, shaped like a lyre, the terminal lobe of the leaf large and rounded with the lower pairs smaller.

Mammaeform, breast-shaped or bearing breast-shaped prominences.

Marcescent, withering but persistent, not falling off.

Maritime, growing on the sea-coast.

Membranous, or *membranaceous,* thin, soft, and more or less pliable like an animal membrane.

Meniscoidal, thin and concavo-convex.

-merous, parts or members; used in compounds, as 5-merous, having 5 parts.

Mesophyte, a common type of plant growing under the most favorable conditions of soil and moisture, characterized as a whole by a lack of special adaptations and by a great and diverse development of the leaf surface; Maples, Alders, and Mustards are typical mesophytes.

Monadelphous, stamens united into one set.

Moniliform, like a necklace or string of beads.

Monocephalous, bearing a single head.

Monoecious, with stamens and pistils in separate flowers on the same plant.

Montane, of or growing in the mountains.

Mucronate, tipped with a mucro or sharp but rather soft point; *mucronulate,* the diminutive.

Muricate, bearing rough and rather sharp excrescences.

Muriculate, diminutive of *muricate.*

Naked, destitute of covering or appendages; naked head, without foliaceous or other bracts surrounding or concealing the involucre or head; naked stem, scape or inflorescence, leafless; naked flower, one without perianth.

-nate, termination meaning divided, as 2-nate, 3-nate.

Nerve, simple or unbranched vein, a slender or secondary rib.

Neutral, a flower having neither stamens nor pistils.

Nigrescent, becoming blackened.

Node, the place on a stem where a leaf is borne.

Nut, an indehiscent fruit with a hard firm wall, resulting from a compound ovary.

Nutlet, a diminutive nut, applied to a fruit derived from a simple ovary, or to a compound ovary which splits up at maturity.

Ob-, prefix, meaning reversed or lower side up.

Obcompressed, flattened on the anterior and posterior sides or fore and aft, instead of laterally or sidewise; obcompressed pod in Cruciferae, flattened contrary to the partition; obcompressed fruit in Umbelliferae, flattened contrary to the commissure; obcompressed achene in Compositae, flattened parallel to the bract.

Obconic, inversely conic.

Obcordate, inverted heart-shaped, with the notch at the apex.

Oblanceolate, inversely lanceolate.

Oblique, unequal-sided, as in leaves which are larger on one side than the other.

Oblong, two or three times longer than broad and with nearly parallel sides, or somewhat tapering to each end from the middle.

Obovate, inversely ovate.

Obovoid, inversely ovoid.

Obsolete, imperfectly or scarcely at all developed, or abortive; for example, the lower lip of a calyx is obsolete when it is obscure or not very distinctly developed.

Obtuse, blunt or rounded.

Opposite leaves or branches, two from each node, proceeding from opposite sides of the stem; "stamens opposite petals," when the stamen is set before the petal; etc.

Orbicular, round or roundish.

Ovary, the part of the pistil containing the ovule or ovules.

Oval, broadly elliptic and a little contracted upward.

Ovate or *ovoid,* egg-shaped.

Ovule, the body in the ovary which becomes a seed; *ovulate,* bearing ovules.

Palate, the lower side of the throat in a 2-lipped corolla.

Palea, chaff-like pappus borne on the achenes of the Sunflower Family; in the Grass Family the upper of the two modified bracts subtending an individual flower; chaff or chaffy bracts.

Paleaceous, in Compositae, chaff-like.

Palmate, with the divisions or sinuses of the leaf pointing to the petiole; palmately compound, with the leaflets all borne at the apex of the common petiole.

Palmatifid, cleft so as to resemble the outstretched fingers of the hand.

Paludose, palustrine, living in a marsh or swamp.

Panicle, a compound flower cluster, a raceme, spike or corymb which is compounded by branching.

Papilionaceous, applied to an irregular corolla with an upper petal or banner, 2 lateral petals or wings and 2 lower petals joined to form a keel.

Papillate, bearing minute nipple-shaped protuberances.

Pappus, the modified calyx-limb borne on the achenes of the Sunflower Family, usually occurring as bristles, naked or plumose hairs, scales or chaff.

Parietal, referring to or borne on the wall or sides of an organ.

Parted, cleft to below the middle.

Pectinate, cleft into closely set divisions like the teeth of a comb.

Pedate, palmately divided with the lateral divisions 2-cleft, thus resembling a bird's foot; *pedately,* in a pedate manner.

Pedicel, stalk or stem of a flower in a flower cluster; *pediceled,* having a pedicel.

Pedicellate, having or possessing a small or short pedicel.

Peduncle, stalk or stem of a flower or flower cluster; *pedunculate,* having a peduncle.

Pellucid, clear, transparent.

Peltate, round, with stalk or petiole attached on the under side at the middle.

Penicillate, with a tip or cluster of fine hairs or bristles.

Perfect, having both stamens and pistils in the same flower.

Perfoliate, where a stem seems to pass through or pierce a leaf.

Perianth, the floral envelopes, including both calyx and corolla when both are present; applied here chiefly to those flowers in which there is no marked differentiation into calyx and corolla.

Pericarp, the wall of a mature ovary or fruit.

Perigynous, inserted on the calyx.

Persistent, falling away very tardily or not at all.

Petal, one of the parts or divisions of a corolla, usually colored; *petaloid,* colored like the corolla or perianth.

Petiolate, having a petiole.

Petiole, the stalk of a leaf.

Petiolule, the stalk of a leaflet.

Phyllopodic, having a leafy base.

Pilose, with long soft spreading hairs.

Pinna, a leaflet or division of a compound leaf.

Pinnate, with the leaflets arranged along each side of a common petiole.

Pinnatifid, cleft in a pinnate manner.

Pistil, the female organ of a flower.

Pistillate, provided with or containing a pistil or pistils, but no stamens; fertile; said of a flower or a plant.

Placenta, that particular portion of the ovary wall which bears the ovules; it is sometimes strongly differentiated; axile placentae are borne on the axis of the ovary or fruit; parietal placentae on the walls of the ovary or fruit.

Plaited. See Plicate.

Plane, flat and even, without elevations or depressions; opposed to concave, convex, revolute, etc.

Plicate, folded into lengthwise plaits or folds.

Plumose, finely and abundantly branched, like a plume.

Pod, general term for any dry fruit which splits open; strictly a legume or follicle.

Polygamous, having perfect, pistillate and staminate flowers on the same individual (polygamo-monoecious) or on different individuals (polygamo-dioecious).

Pome, an inferior fleshy fruit with more than one carpel.

Posterior, the side behind, in an axillary flower the side next to the axis; superior; upper.

Prickly, armed with prickles or short sharp hard outgrowths of the epiderms of leaves or stems.

Prismatic, shaped like a prism, with flat faces separated by angles.

Procumbent, lying along the ground with ascending tips.

Produced, lengthened or extended.

Proliferous, bearing supplementary flowering branches or shoots from or near the summit or from the inflorescence, which surpass the stem or inflorescence.

Prostrate, lying close along the ground.

Proterandrous, the anthers of a perfect flower dehiscing before the stigma is receptive; *proterogynous,* the reverse condition.

Puberulent, minutely pubescent.

Pubescent, clothed with hairs, especially soft or downy hairs.

Punctate, dotted with point-like depressions.

Pungent, terminating in a rigid, sharp or prickly point.

Pustulate, dilated like a blister.

Quinate, borne in or divided into fives.

Raceme, a flower cluster in which the flowers are borne along the peduncle on pedicels of nearly equal length.

Racemose, like a raceme.

Rachilla, in Gramineae, the axis of a spikelet on which the florets are borne.

Rachis, the axis of a spike or raceme, the prolongation of the peduncle through the flower cluster; the axis or midrib of a compound leaf or prolongation of the petiole; in Gramineae the main axis and branches of an inflorescence, on which the spikelets are borne.

Radiate, arranged around or spreading from a common center; bearing rays.

Rameal, borne on the branches.

Ranks, successive rows.

Ray, in the Parsley Family, one of the primary branches of an umbel; in the Sunflower Family the ligule of a ray-flower, the ray-flowers or ray-achenes being marginal on the head.

Receptacle, in a flower, that portion of the stem on which the sepals, petals, stamens and pistils are borne; in an inflorescence it is the axis or abbreviated stem on which the flowers are borne, as the axis of the head in the Sunflower Family.

Reflexed, turned downward or backward.

Refracted, turned abruptly downward.

Regular, the parts in a circle having the same size and shape.

Remote, as in the case of flowers, leaves or fruits distantly spaced on an axis.

Reniform, kidney-shaped.

Repand, with slightly uneven margin.

Reticulate, with a network; netted.

Retrocurved, curving backward.

Retrorse, turned or pressed backward.

Retuse, with a broad shallow notch.

Revolute, rolled backward from each side.

Rhombic, quadrangular but the lateral angles obtuse; *rhomboidal,* more or less rhombic.

Rib, a primary vein of a leaf.

Rootcrown, the more or less short stem or axis crowning the root, often woody, simple or branched and persistent; frequently called a caudex.

Rootstock, prostrate or underground root-like stem, sending up from season to season herbaceous shoots and bearing roots on the under side.

Rostrate, with a beak or spur; narrowed into a slender process; *rostellate,* the diminutive.

Rosulate, said of basal leaves spreading in a circle or rosette on the ground.

Rotate, wheel-shaped; spreading flat or horizontally and circular in outline.

Rudiment, an imperfectly developed organ, a vestige.

Rugose, having wrinkles or rugae; *rugulose,* finely wrinkled; *rugulae* fine wrinkles.

Runcinate, sharply incised with the teeth or incisions turned downward.

Runner, a slender prostrate stem rooting, more or less, at the nodes.

Saccate, bearing distensions or sac-like bodies.

Sagittate, shaped like an arrowhead.

Salient, projecting prominently, in an isolated manner, beyond the main body or series.

Salverform, having a border or limb spreading at right angles to a slender tube.

Samara, an indehiscent winged fruit like the key of a maple.

Saprophyte, living upon dead organic matter and thus destitute of chlorophyll.

Scabrid, slightly scabrous.

Scabrous, rough to the touch; *scabrulose, scaberulous,* minutely scabrous.

Scale, a small thin body, not at all or little green, commonly glabrous.

Scape, a leafless flower-bearing stem arising from the ground.

Scarious, thin, dry and not green.

Scobiculate, bearing fine or sawdust-like particles.

Scorpoid, said of a 1-sided inflorescence which is circinately coiled in the bud.

Scrobiculate, marked with numerous small depressions.

Scurf, small bran-like scales on the stem or leaves.

Secund, inserted on (or turned to) one side of the stem.

Sepal, a leaf or division of the calyx.

Septal, relating to a septum; *septate,* bearing a septum.

Septicidal, a capsule splitting between the partitions of the cells.

Septum, a partition in an ovary or fruit.

Sericeous, silky with straight soft hairs.

Series, successive rows.

Serrate, toothed or saw-like, with the teeth turned forward or upward; *serrulate,* the diminutive.

Sessile leaf, leaf without a petiole and the blade seated directly on the stem; sessile ovary, one without a stipe.

Set, a cluster or collection of organs of the same kind.

Setaceous, bristle-like.

Setose, beset with bristles; *setulose,* the diminutive.

Sheath, where the base of the blade or expanded petiole completely encloses or sheathes the stem for some distance above the node.

Shrub, a branching woody plant, commonly without distinct trunk, usually about 2 to 12 ft. high. There are no rigid limits between shrubs and trees, or between shrubs and herbs.

Silicle, a short silique not much longer than wide; sometimes indehiscent.

Silique, a 2-celled capsule, several times longer than wide, the valves splitting from the bottom and leaving the placentae with the false partition stretched between.

Simple, unbranched or without branches; simple leaf, the blade composed of one piece; simple pistil, of one carpel.

Sinistrorse, turned toward the left.

Sinuate, with a recessed margin.

Sinus, with a recess or indentation; literally a bay.

Smooth, not rough; opposed to scabrous, echinate, etc. Cf. Glabrous.

Sordid, of a dull white or dirty hue.

Spadix, a spike with a fleshy axis.

Spathe, a bract enclosing a flower cluster; *spathaceous,* of the nature of a spathe.

Spatulate, rounded above and contracted below to a narrow or slender base.

Spicate, in the form of a spike; spike-like, especially when flower clusters are arranged spicately.

Spike, a flower cluster in which the flowers are sessile and more or less densely arranged along a common peduncle.

Spikelet, a secondary spike; the flower-cluster of Grasses.

Spine, a sharp-pointed hard woody organ; homologous with a leaf; *Spinescent,* ending in a spine or sharp rigid point; *spinose,* furnished with spines or of a spiny character; *spinulose,* the diminutive.

Spur, a slender and hollow extension or prolongation of some part of a flower, as the petal of a Columbine or calyx of a Larkspur.

Squama, a scale; *squamate,* scale-like; *squamella,* a diminutive scale; *squamellate,* like a little scale.

Squarrose, with stiff spreading processes, as the tips of bracts.

Stamen, one of the male organs of the flower.

Staminate, bearing or containing stamens but no pistils; sterile or not seed-bearing; said of a flower, flower cluster or plant.

Staminodium, a sterile stamen, usually one in which the anther is wholly obsolete and the filament much developed or dilated.

Stellate, with rays like those of a star, star-shaped.

Sterile, barren; a stamen without anther or an anther without pollen; a flower without a pistil or with infertile ones; ovary without good ovules.

Stigma, the receptive part of the style which secretes a sticky or viscid substance.

Stipe, stalk by which the ovary or fruit is raised above the receptacle.

Stipels, stipules of the leaflet.

Stipitate, having a stipe.

Stipules, small supplementary organs or appendages of the leaf, borne in pairs at the base of the petiole.

Stolon, a stem or branch bending or curving down at tip and there rooting. Cf. Runner.

Stoloniferous, bearing stolons.

Striate, marked with longitudinal lines, grooves or ridges.

Strict, close or narrow, closely upright and straight, not spreading.

Strigose, with straight appressed hairs or bristles.

Strophiole, an appendage near the hilum of seeds.

Style, the contracted or slender portion of a pistil between the ovary and stigma.

Stylopodium, the enlargement or disk-like expansion at the base of the style, as in Umbelliferae.

Sub-, prefix, meaning somewhat, nearly, or below, depending upon the context.

Submerged or *submersed,* growing under water.

Subulate, awl-shaped.

Succulent, juicy or fleshy.

Suffrutescent, woody at base, with a persistent woody portion above ground, but no implication of diminutiveness. Cf. Fruticulose.

Sulcus, a groove or furrow; *sulcate,* grooved or furrowed.

Superior, growing or placed above; superior ovary, one free from the calyx; superior stamens or superior lip of corolla, the stamens or lip on the upper side.

Symmetrical, with the same number of parts in each circle throughout the flower.

Sympetalous, petals more or less united into one piece, so that one can not be taken away from the rest without tearing.

Synsepalous, sepals more or less united.

Taproot, a single and often strong root descending perpendicularly into the earth.

Terete, round in the sense of cylindric.

Ternate, occurring or divided into threes.

Thorn, a sharp-pointed hard woody organ, homologous with a stem.

Throat, the upper expanded portion or orifice of the corolla-tube.

Thyrse, a close or contracted ovate panicle; *thyrsoid,* resembling a thyrse.

Tomentose, covered with soft or woolly hairs or tomentum.

Torulose, cylindrical but bulging irregularly at intervals.

Tri-, a prefix to Latin words, three or thrice.

Trichotomous, forking, with the three divisions from the same point and nearly equal.

Trifid, 3-cleft to the middle or somewhat more or less.

Trigonous, 3-angled, with plane faces.

Tripinnate, thrice pinnate.

Triquetrous, 3-sided.

Triternate, thrice ternate.

Truncate, cut off squarely at the end.

Tuber, a thickened fleshy and more or less rounded underground stem or root.

Tubular, shaped like a tube or hollow cylinder.

Tufted, short, close, and several or many together from the same stock. (See Caespitose.)

Tunicated, having several closely fitting coats.

Turbinate, top-shaped.

Turgid, distended or inflated.

Two-lipped, said of a sympetalous corolla or a synsepalous calyx with an upper and a lower lobe or division. See Bilabiate.

Umbel, branches nearly equal and proceeding from the same point, so as to form a flat-topped flower cluster.

Umbellet, one of the secondary umbels of a compound umbel.

Umbilicate, depressed in the center.

Undulate, wavy or wavy-margined.

Unisexual, flowers containing pistils only, or stamens only.

Urnshaped, globular and contracted at the mouth like an urn or pitcher.

Utricle, a 1-seeded carpel with loose coat; *utricular,* of the nature of a utricle.

Valvate, opening by doors or valves; said of flower-buds when the parts meet exactly without overlapping.

Vein, in a leaf, a branch of a secondary rib or nerve.

Ventral, relating to or borne on the face; upper; inner; anterior.

Ventricose, distended or swollen on one side and not on another.

Venulose, having veins.

Versatile, swinging, turning freely on its support.

Verticil, with the organs in a whorl or circle; *verticillate,* having the nature of a verticil.

Villous, bearing long soft hairs, often shaggy.

Virgate, long, slender and straight, like a virga or rod.

Viscid, sticky.

Vitiform, grape-like.

Whorl, with the organs borne in a circle.

Wing, any thin expansion attached to an organ; the lateral petals in a papillionaceous flower.

Xerophyte, a plant adapted to live in dry soil, on the desert, in sand or on rocky ridges, chiefly characterized by great thickening of the epidermis, condensation of the plant body, or reduction of the leaf surface. Cactus, Buck-brush, Manzanita and Pickeringia are typical xerophytes.

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